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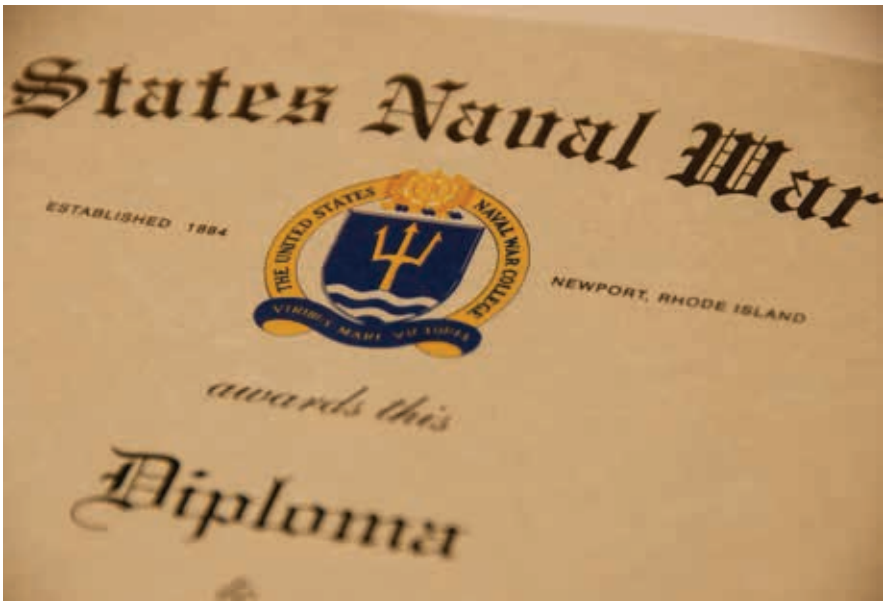
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FROM THE EDITORS

In recent testimony to the House Foreign Affairs Committee, Peter A. Dutton of the Naval War College offered a timely and incisive analysis of the aims and tactics of China in its ongoing maritime disputes in the East and South China Seas. We take the liberty (with his permission, of course) of reproducing that testimony here. Professor Dutton emphasizes the sophisticated—indeed, sophistical—strategy the Chinese have pursued in the international legal arena, so far with some apparent success. He believes that our allies in the region are anxious to see the United States take a greater leadership role on these issues. Peter Dutton, a former Judge Advocate General naval officer, is the director of the College's China Maritime Studies Institute.

The First World War, or the "Great War," as it was initially known, broke out just one hundred years ago, in the summer of 1914. This cataclysmic struggle ended a century of almost undisturbed peace among the great European powers and changed the course of modern history in incalculable ways. It has been said that while history never repeats itself, it sometimes rhymes. The aggressive naval modernization currently being pursued by the People's Republic of China, clearly intended to challenge the long-standing naval preeminence of the United States, is more than reminiscent of the naval buildup championed by Kaiser Wilhelm of imperial Germany in the decades leading up to that war. John H. Maurer, in "Averting the Great War? Churchill's Naval Holiday," recounts the bold (and much criticized) efforts of Winston Churchill, then First Lord of the Admiralty, to tamp down the costly and dangerous naval arms race with Germany through promoting a "holiday" on capital-ship construction by both powers. These advances were flatly rejected by the Germans. In spite of British pledges to match and exceed new German hull construction, the German leadership continued undeterred on the path to war, one they foolishly ignited (by the invasion of Belgium) in a way that would ensure the entry of Great Britain in the lists against them. In this light, it is sobering to contemplate the conclusions the current Chinese leadership are drawing from the unilateral building "holiday" the U.S. Navy seems to be facing for the foreseeable future. John Maurer is Alfred Thayer Mahan Professor of Sea Power and Grand Strategy at the Naval War College.

As the United States and the rest of the world become more accustomed to—if not more comfortable with—a growing Chinese maritime presence and

assertiveness, it is well to be reminded that China in the course of its long history has had only a very episodic engagement with the sea, in spite of its long and exposed sea frontier. Bernard Cole, in "The History of the Twenty-First-Century Chinese Navy," provides a useful overview of what in retrospect is the very surprising neglect of the sea by the dynasts of ancient China as well as their modern successors. With the exception of the famous voyages of Admiral Zheng He to Southeast Asia, the Persian Gulf, and East Africa in the fifteenth century (much celebrated by today's Chinese leadership and a point of general national pride), China has shown little interest in projecting naval power much beyond its own territorial waters. The reasons for this appear to be a combination of preoccupation with external land threats, a relatively undeveloped overseas commerce, and the absence of external maritime threats, at least prior to the mid-nineteenth century. All of this, of course, has now changed. Yet the history of Chinese naval power in the twenty-first century remains largely to be written. We should be mindful that China's maritime excursions in the past have been regularly short-circuited by such factors as internal turmoil, bureaucratic indifference, and foreign pressures. The United States and its allies would be wise to keep this in mind as they contemplate the future of their own naval and maritime capabilities.

In "A Theory of Naval Airpower," Robert C. Rubel offers an original and compelling account of how one should think about naval aviation in the Navy of yesterday, today, and tomorrow. Acknowledging that many naval officers remain allergic to anything that smacks of naval "doctrine," Rubel contends that there are significant practical benefits to be derived from this exercise. He focuses in particular on the Navy's need to clarify its requirement to maintain operational control of naval air assets in maritime environments in the face of Air Force efforts to capture all aviation under a single Joint Force Air Command Center headed by an Air Force officer. Captain Robert C. Rubel, USN (Ret.), a former naval aviator and frequent contributor to this journal, is the soon-to-depart dean of the Center for Naval Warfare Studies at the Naval War College, a position he has held for the last eight years. In that capacity he has provided, among other things, guidance and oversight to the Naval War College Press, helping to ensure that it continues to adhere to the high standards for which it has long been known. A collection of his essays, *Writing to Think: The Intellectual Journey of a Naval Career,* has recently been published by the Press as Newport Paper 41. We wish Barney fair winds and following seas.

Our next two offerings in this issue are something of a departure. Yedidia Ya'ari's "The Littoral Arena: A Word of Caution," reprints in essentially unaltered form an article originally published in the Spring 1995 issue of the *Review.* This prescient piece, by a then-serving admiral in the Israeli navy, was called to our attention

by Wayne P. Hughes, Jr., who provides a brief appreciation of its continuing—indeed, growing—relevance for the present.

In "Reinventing the Drone, Reinventing the Navy: 1919–1939," Angelina Long Callahan opens a fascinating window into the interwar development of drone technology in the U.S. Navy, especially the contributions of the Naval Research Laboratory in Washington, D.C. With a glance at the current state of play in this dynamic area today, she draws a number of lessons from this episode, one of continuing relevance to the present. Finally, in "Future Mine Countermeasures: No Easy Solution," Martin Schwartz provides a careful analysis of another little-discussed aspect of naval warfare that is of growing concern to the United States as well as its NATO allies. Commander Schwartz currently serves in the German Navy.

NEWPORT PAPER 41, BY DEAN "BARNEY" RUBEL

In his introduction to our newest (and forty-first) Newport Paper monograph, *Writing to Think: The Intellectual Journey of a Naval Career,* Captain Robert C. "Barney" Rubel writes, "The articles in this Newport Paper are a selection of those that I have published (all but one of them) over the years in various publications. I did not write them to 'get published'; I wrote them because I am a true extrovert—I have to talk, or write, in order to think." A complete collection of the writings of Captain Rubel, who will be retiring this summer as Dean of Naval Warfare Studies here at the Naval War College, would have made a long volume indeed—and his continuing flow of new work would have made it incomplete before its appearance. This monograph is available in PDF form on the Naval War College Press website (at www.usnwc.edu/press, "Newport Papers") and in print by request, while supplies last, from the editorial office.

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CHINA'S MARITIME DISPUTES IN THE EAST AND SOUTH CHINA SEAS

Testimony by Peter A. Dutton before a Hearing of the House Foreign Affairs Committee, 14 January 2014.

China pursues its security through interior strategies that involve the development of rings of security around central areas of national interest. The Chinese have long felt vulnerable from the sea, and their current maritime strategy seeks to reduce that vulnerability by extending a ring of maritime control around China's periphery. China pursues this control through a combination of force-structure development and legal assertions. Tensions arise because China's strategy conflicts with the territorial claims, resource interests, and security concerns of other states in East Asia. China's strategy also causes friction with the United States, which relies on freedom of navigation in maritime East Asia for American security interests and which must reassure regional allies and partners that American security guarantees are meaningful. In order to ensure the position of the United States in East Asia, American policies must focus on maintaining the region as an open, maritime system. This requires continuous development of technological advantages to ensure that the center of power in Asia does not migrate from the maritime domain to the continent. It also requires the United States to support the ability of allies, friends, and partners to resist China's non-militarized coercion, as well as to reinforce the normative structure that supports the efficacy of maritime power in the region and around the globe.

What Does China's Extension of Its Power over the Near Seas Gain for China?

The extension of China's strategic power over its "near seas" through expanding military capabilities, growing law-enforcement capacity, and sweeping legal frameworks, all augmented by orchestrated civilian activities and political and economic arm-twisting, has deep strategic roots. These roots are nourished by China's historical approach to dealing with its security environment by developing continental strategies, also known as "interior strategies"—an approach China continues to take today. Interior strategies generally involve the

development of expanding rings of security around a state's territory, especially territory of fundamental strategic value. Over China's long history, the territory of critical strategic value has consistently been the Han heartland, which extends from Beijing in the north to the coastline of Guangzhou Province in the south, and from the mouths of the Yellow, Yangtze, and Pearl Rivers in the east inward to the great mountain ranges west of Sichuan Province. Around this central area Chinese dynasties for centuries employed, to enhance their own security, various techniques to exert control or influence, such as enculturation, development of an economic and political tribute system, and even conquering peripheral territories and incorporating them under Chinese sovereignty. In this way, at the historical height of Chinese power the Qing dynasty guaranteed the nation's security by incorporating under Chinese sovereignty a great arc of territory beyond the traditionally Han regions. That arc extended from Manchuria in the east (including large areas of today's Russian Far East), west through Mongolia to modern Xinjiang Province, and south to Tibet. Much of that territory remains under Chinese control today and for similar purposes—it provides a strategic buffer for the modern Chinese state, just as it did for previous dynasties.

Qing leaders failed, however, to complete a similar arc of security on their southern and eastern maritime flanks, leaving China strategically vulnerable to European advances in sea power. Thus, during the period from the British Opium War, beginning in 1840, to the Japanese invasions of the Chinese mainland that ended in 1945, China's security and sovereignty were severely compromised by its failure to develop maritime power sufficient to overcome Western naval technologies.

Chinese strategists today fully grasp that nineteenth-century European naval power fundamentally altered the nature of Asia as a strategic system. Up until that time, China dominated a relatively closed region. Security for China meant the maintenance of strong armies with the capacity to overpower threats that might invade from the north or west. No combination of states in the region could generate sufficient land power to challenge China, and none of the region's island states had naval power sufficient to pose a threat to China's fundamental security from the sea. Nearly all strategic events in East Asia prior to 1840 occurred on the continent and involved amassing strong armies, maneuvering them across land to meet potential enemies, and building layered defenses to secure the Chinese homeland. Beginning in 1840, however, the Royal Navy demonstrated to the Chinese that British naval power was superior not only to China's existing coastal defense system but to any coastal defense system that China at the time had the technological capacity to produce. Thereafter, Chinese security became much more complex.

Since the Opium War, China has been required to deal with a combination of continental and maritime strategic concerns, and it has never yet, in its own eyes, been able to deal adequately with the maritime aspect of its security equation. For nearly two centuries the dominant thrust of Asian history has involved the projection of power across the East and South China Seas, and East Asia remains a maritime strategic system today. It is a system in which strategic events are driven by technology rather than by armies, in that projection of power (or the preparation for it) is driven by advancements in the ability to maneuver sea, air, space, and cyber technologies to a regional decisive point as required. The dominant maneuver space is therefore no longer the great interior plain of Asia but rather the common sea, air, and space area of China's near seas. Thus, the introduction by the British of advanced military technology to maritime Asia marked a tectonic shift in Asia's strategic focus from continental to maritime events. Nineteenth-century China was caught unprepared for the shift in that era; today's Chinese leaders have developed national power in part to ensure their country is never again caught unprepared on its maritime flank. First and foremost, it is the failure of previous Chinese leaders to close the maritime gap in China's arc of security and the invasions that resulted that motivate China's current leaders to extend strategic power over the near seas.

What extending control over the near seas gains for China, therefore, is first the enhancement of security for the Chinese state in conjunction with the healing of a sort of psychological wound in the collective Chinese mind. Importantly, demonstrating the power to close the gap also accrues credibility for the current Chinese leadership and helps solidify the place of the Communist Party as the ruling entity of the Chinese state.

Second, as China has advanced its capacity to assert its will in the near seas, it has increasingly caused friction with its maritime neighbors and the United States. East Asian geography, with its long chain of fringing islands stretching from the Kuriles to Singapore, lends itself to the development of a maritime system if certain conditions are met. The first condition is that regional maritime technological power, generally naval power, must be sufficient to overcome the continental power's ability to sweep it from the near seas. Dominant maritime power in the region was first introduced by the British, then developed by Japan, and since the end of the Second World War it has been maintained by the United States and its allies. The second condition is that in order to remain dominant over the continental power, the maritime power must have ready access to bases and the resources necessary for sustainment. American bases in Guam and Hawaii are not enough to ensure for the United States the strategic influence of sea power over the East Asian seas. Accordingly, such access requires, and is provided by, America's allies, partners, and friends in the region.

But why do the United States and its regional partners expend the effort and pay the costs associated with maintaining East Asia as a maritime system? East Asia's maritime states—Japan, the Philippines, Malaysia, Brunei, Indonesia, and Singapore—all cooperate with the United States because they benefit politically and economically from remaining outside the arc of China's control. Should the system revert to one dominated by the continent, even if China chose not to dominate actively the peripheral states, China's capacity to do so would narrow the political and economic options available to them. Likewise, the United States benefits from the maintenance of an open, maritime regional system in East Asia because it supports American global and national security strategies, ensures American economic access to the region, and sustains American political influence there.

A fundamental cause of friction, therefore, lies in the fact that China's regional maritime strategy appears to have as its aim a reversal of the tectonic shift brought about two centuries ago by the introduction of superior foreign naval technology and a restoration of the regional system to its continental past. In other words, the aim of China's regional maritime strategy is to expand China's interior to cover the maritime domain under an umbrella of continental control. This expansion is security oriented in nature, but it also incorporates all aspects of Chinese power to advance China's aims of asserting sovereignty over near-seas islands, extending jurisdiction over the near-seas water space, and cementing political and economic relations in Asia around Chinese influence. Thus, in addition to enhancing China's security and the legitimacy of its rulers, if Beijing is successful in reverting East Asia from a maritime system to a continental system it will reap economic and political benefits from its capacity to control events throughout the region without the costs associated with competition from either a regional or an outside power.

What Is the Connection between Chinese Activities around the Senkaku Islands and China's Larger Strategic Objectives?

Chinese activities around the Senkaku/Diaoyu Islands have since December 2008 been designed to create circumstances that put Japanese control over the islands in doubt. Chinese activities are carefully calibrated to achieve the objective without provoking outright conflict with the United States. Accordingly, China's strategy can best be described as "nonmilitarized coercion."* China has so far rejected most institutional approaches to dispute resolution, such as multilateral negotiation or arbitration, maintaining instead a stated preference for resolving its

* Peter Dutton, "*Viribus Mari Victoria?* Power and Law in the South China Sea" (Center for Strategic and International Studies conference, "Managing Tensions in the South China Sea," 5–6 June 2013), available at csis.org/.

maritime disputes through bilateral negotiation. Indeed, as one leading academic puts it, the "recent growth in military, economic and other forms of China's hard power will be put to best use in bilateral negotiations."* In other words, China's leverage against other disputing states, engaged individually, is sufficiently high to ensure outcomes favorable to China. Understandably, therefore, bilateral negotiations have gone nowhere over the past two decades. China simply demands more than its negotiating counterparts are willing to give up.

On the power side of the equation, China has been deterred since the late 1980s from using armed conflict to resolve its maritime disputes. But since 2008 China's strategic emphasis has settled into the gap between armed and institutional approaches. In this gap lies the power-based approach of nonmilitarized coercion, which involves the direct and indirect application of a broad range of national capabilities to alter the situation at sea in China's favor. The operational aspects of the strategy have been all too apparent over the past four years: increasing development of civilian law-enforcement capacity, reorganization and streamlining of civilian agencies, increased tempo of operations by maritime law-enforcement vessels in disputed areas—all in coordination with civilian fishing vessels, in what might be termed a maritime-style "People's War." Maritime law-enforcement and other civilian vessels form the core of this strategy—hence *nonmilitarized* coercion—but in this strategy there is also an important indirect role for the Chinese military. It is never far from any action, its nearby presence serving to deter China's opponent from considering escalation. The growing capabilities and regional presence of the People's Liberation Army (PLA) Navy also serve the strategy by applying psychological and political pressure on regional leaders, limiting their freedom of action.

A well-developed legal component augments the operational aspects of China's strategy of nonmilitarized coercion. One representative article that captures this concept well was published in the journal *China Newsweek* in November 2012, at the height of the unfolding tensions between China and Japan over the Senkaku/Diaoyu Islands. The article observes that China employs a "legal rights protection chain" to reinforce its operational efforts as part of the overall strategy to achieve control over the islands and waters of the near seas. In this case, specifically the Senkaku/Diaoyu Islands,

> China's legal behavior throughout can be divided into several levels: first was enacting law, as seen with the promulgation of the Statement on Territorial Sea Baselines; second was formulating implementation measures [to put the law into effect] . . . ; third was law enforcement, as seen with China Maritime Surveillance vessels patrolling the

* Han Yong, "A Maritime Legal Contest," *China Newsweek,* 26 November 2012, pp. 29–33 [China Maritime Studies Institute translation].

> waters of the Diaoyu Islands; and fourth was pursuing international validity, as seen with filing the coordinates and maps with the UN and deciding to submit a case for an extended continental shelf.*

The first two steps in particular of this legal process are aimed at energizing the capacities of all relevant agencies of the Chinese government. As the article notes in reference to the application of this legal strategy to the South China Sea, "the significance of creating administrative zones is that it provides performance incentives for government departments." Additionally, China's calculations regarding how and when to move from one stage in this process to the next are carefully influenced by its assessment of power dynamics.

The article notes, "To get the upper hand, China must involve both military and administrative presence as well as nongovernmental presence. . . . Integrated military, administrative and nongovernmental presence constitutes a mutually reinforcing chain of presence." The integrated process described above accurately depicts the approach China takes in the East China Sea to contest Japan's control over the Senkaku/Diaoyu Islands. It also accurately describes events at Scarborough Shoal in the South China Sea, over which China wrestled full control from the Philippines. There are many other examples in various stages of development, including China's continental-shelf claim in the East China Sea and many actions that advance China's claim to administer the waters within a U-shaped line in the South China Sea. In short there is a steady drumbeat of combined Chinese legal and power operations throughout the near seas.

What Is the Connection among China's Near-Seas Strategy and Its Recent Announcement of an ADIZ over the East China Sea and the* Cowpens *Incident in the South China Sea?

China's strategy to control water and airspace is similar to its "power and law" approach to control islands in the East and South China Seas. What has been clear to many American observers since at least the 1 April 2001 EP-3 incident is that China's strategic approach to enhancing its jurisdictional control over the near seas involves both a force-structure component and a legal component. The purpose of the force-structure component is obviously to develop the power to dominate events in the near seas according to China's will. It extends China's umbrella of security over its maritime periphery and is entirely consistent with the interior security strategy. The purpose of the legal component of China's strategy is to articulate a legitimizing narrative for the development and employment of this power. There are two general audiences for this message: it is designed to persuade the Chinese people that their government's actions are justified, and it seeks to build a favorable international environment, where possible.

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* Ibid. The next two quotations are also from this source.

That the Chinese use the language of international law is not to say they seek at all times to *comply with* international law. Rather, they use legal language for its power to cloak in a mantle of legitimacy China's power-based actions in pursuit of its national interests.* China's announcement of an "air-defense identification zone" (ADIZ) over the East China Sea in November 2013 was entirely consistent with this strategy to use legal language to increase Chinese jurisdictional control incrementally over the near seas. Because the announced ADIZ does not fully comport with existing international law, the announcement raised tensions with Japan, the United States, and others.

As a general matter, it is entirely normative for a coastal state to establish an ADIZ in the international airspace off its coastlines to enhance and protect its national security. Such zones are legitimate as a matter of international customary and treaty law related to airspace and national security.† But China's announcement is an excellent example of how it uses the language of international law while disregarding the actual constraints of the law. There are at least three legal problems with China's ADIZ.

The first problem is that it covers the Senkaku/Diaoyu Islands, which are administered by Japan. Even though China disputes Japanese sovereignty over these rocky outposts, Japan, as the islands' administrator, has a duty to exercise its sovereign authority over the islands, including in the national airspace above them and the territorial sea around them. Since the ADIZ asserts Chinese rights to operate within the entire zone, to control the activities of others within it, and to take unspecified "emergency measures," and because it covers the airspace over and around the Senkaku/Diaoyu Islands, the Chinese ADIZ poses a direct affront to Japanese sovereign responsibilities. If the Chinese choose to operate in the national airspace above the Senkaku/Diaoyu Islands, as their announcement implies the right to do, that act will be not only seriously provocative but an illegal violation of Japan's current administrative authority there.

The second problem is that the terms of the ADIZ announcement purport to regulate the activities of *all* aircraft in the zone. As a practical matter, an ADIZ is a sorting-out mechanism by which the coastal state determines which aircraft in the international airspace off its shores might potentially threaten its national security. As a legal matter, an ADIZ declaration confers almost no additional jurisdictional authority on the coastal state. It cannot do so—the airspace beyond twelve nautical miles from the coastline is international in character by the

* Jonathan Odom, "A China in the Bull Shop? Comparing the Rhetoric of a Rising China with the Reality of the International Law of the Sea," *Ocean and Coastal Law Journal* 17, no. 2 (2012), p. 201.

† Peter Dutton, "*Caelum Liberam:* Air Defense Identification Zones in Non-sovereign Airspace," *American Journal of International Law* 103, no. 4 (2009), p. 691.

terms of the Chicago Convention, and accordingly all states possess the right to operate civil or military aircraft there without the coastal state's permission. The only legitimate exercise of coastal-state jurisdiction in an offshore ADIZ is over aircraft intending to leave international airspace and enter the coastal state's fully sovereign national airspace. As it might require a visa stamp in a passport before entry, the coastal state can specify ADIZ procedures by which aircraft obtain permission before entering national airspace. Accordingly, the fact that the terms of China's ADIZ purport to bring the activities of *all* aircraft operating in or through the ADIZ under Chinese control, not just those desiring to enter China's national airspace, is an unlawful extension of Chinese jurisdiction into airspace that is international in character.

A third legal problem stems from this overbroad claim to regulate the activities of *all* aircraft in the ADIZ. Military aircraft are sovereign immune from the jurisdiction of other states when they are operating in international airspace. Chinese officials and scholars alike have long claimed—incorrectly, in my view—that the United Nations Convention on the Law of the Sea (UNCLOS) gives additional legal protection to a coastal state's security interests in *and above* the exclusive economic zone.* There is also good reason to believe the Chinese apply legal protection for their security interests beyond the EEZ to a broader category of what they call "Chinese jurisdictional waters" and the airspace above them. Such waters appear to include China's claimed continental shelf and additional waters over which China claims historical rights. In this sense it is important to note that the eastern edge of China's ADIZ closely follows the eastern edge of China's expansive East China Sea continental-shelf claim. Taken together, China's overbroad claim to regulate the activities of all aircraft in its ADIZ, its assertion that UNCLOS protects its security interests in and above its jurisdictional waters, and its decision to align the limits of its ADIZ with the limits of its continental shelf claim suggest that China's ADIZ is part of a coordinated legal campaign. This campaign would extend maximal security jurisdiction over the East China Sea and the international airspace above it, beyond those authorities currently allowed by international law, in support of China's objectives related to security, resource control, and regional order.

It is in this context that the *Cowpens* incident should also be interpreted. On 5 December 2013, the guided-missile cruiser USS *Cowpens* was operating in the South China Sea outside sovereign waters, where high-seas freedoms apply. It was forced to maneuver to avoid a collision when a PLA Navy amphibious ship crossed its path and came to a stop. The PLA Navy's action was apparently prompted by the belief that USS *Cowpens* was monitoring the activities of China's

* Ibid.

new aircraft carrier, *Liaoning,* and that China has a right to prevent American ships from doing so.*

The actions of the Chinese naval vessel were dangerous, and its failure to exercise due regard was serious. In my view, however, the most significant problem brought to light by this incident is that China asserts the right to ban any ship from entering large areas of nonsovereign waters in the near seas for long periods of time if the Chinese plan to undertake naval exercises there. This is an impermissible infringement on the rights and freedoms of all states to operate freely at sea. Specifically, in the weeks before the *Cowpens* incident, the China Maritime Safety Administration reportedly declared a "ban on entry" into certain waters in the South China Sea between the dates of 3 December 2013 and 3 January 2014—although by some accounts the purported ban was not made public by the PLA prior to the confrontation on 5 December.† Either way, the area of the purported ban was entirely outside the sovereign waters of China, in a zone where international freedoms of navigation pertain. *Cowpens* was exercising those international freedoms, and—zone or no zone, ban or no ban—the PLA Navy had no legal right to impede its progress.

China's many operational actions in the near seas and its use of the language of international law to seek legitimacy for these actions represent the steady unfolding of China's strategy to develop an arc of maritime control across those seas. Accelerated Chinese activities around the Senkaku/Diaoyu Islands, the ADIZ announcement, and the *Cowpens* incident are just the most recent "battles" in China's security campaign in the region. Unless current trends change, there is no reason to believe that China's campaign will stop short of achieving its aims.

What Are the Policy Implications of the Strategic Dynamics in East Asia?

Some American commentators have suggested China's strategy is in response to the U.S. pivot to Asia, but that view seems too self-referential. Chinese actions are about Chinese objectives, and those objectives have been consistent for decades, because they are based on China's enduring geography-driven security interests. That suggested view also ignores solid evidence that China's current strategy began to unfold as early as December 2008, before the current administration came into office and, of course, years before it announced a pivot or rebalance to Asia. I think it is fairer to say that China is undertaking its strategy *despite* the American rebalance to Asia.

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* Anna Mulrine, "Why China Forced a Confrontation at Sea with the US Navy," *Christian Science Monitor,* 14 December 2013; "China Paper Says US Ship Harassed China Fleet," Associated Press, 15 December 2013.

† Sui-Lee Wee reports, "Even before the navy training, Chinese maritime authorities . . . posted a navigation notice on their website"; "China Confirms Near Miss with U.S. Ship in South China Sea," Reuters, 19 December 2013. Others familiar with the incident suggest otherwise.

It is important to note as well that in order to mitigate American strategic dilemmas, Chinese leaders express a desire to develop a "new-type great-power relationship" with the United States. Indeed, the United States should seek to develop such a relationship with China, but it should not do so at the expense of maintaining an open, maritime system in East Asia. Unless some fundamentally new form of security architecture can be devised that makes regional geography and the tensions between interior and exterior power irrelevant—and frankly, I do not see how such an architecture could be developed, given the current state of political development in East Asia—American security interests and those of America's regional allies, partners, and friends will continue to require that the United States bear the burden of ensuring the maritime character of the regional system. The strategic advantages of doing so are worth the expense, in that they provide

1. Security for American soil that comes from the maintenance of the American global exterior position
2. Political and economic independence of regional states in East Asia and the global credibility that accrues to the United States from its ability to support them
3. Political access for American influence in the region
4. Assured economic access and the benefits it provides to the American economy.

Accordingly, American regional objectives should continue to focus on maintaining regional stability and deterring conflict as a means of resolving disputes. To do so, first and foremost the United States must develop and deploy the naval, air, space, and cyber technologies required to ensure that East Asia remains a maritime system. It is the only way that the United States can continue to ensure that conflict as a means of regional dispute resolution remains off the table. In terms of naval power, I am especially concerned that the United States commit to investing in maintaining its advantage in undersea warfare. The undersea domain is perhaps the linchpin for preventing East Asia from reverting to a continental system in the twenty-first century. Other key areas of investment will be in maintaining American advantages in maritime domain awareness and in C4ISR.* The United States also needs to reduce vulnerabilities to its surface fleet, to its regional bases, and to its logistics train across the Pacific.

Second, American policies should focus on allowing regional states to expend scarce resources on countercoercion capabilities. By focusing on military

* C4ISR is an acronym for command, control, communications, computers, intelligence, surveillance, and reconnaissance.

deterrence, the United States allows regional states to allocate more of their defense resources on developing coast-guard and other nonmilitary capabilities necessary to withstand Chinese coercive pressure at sea. Additionally, American policies should encourage other states to play supporting roles by providing financial support for building "white hull" capacity to resist Chinese pressure. Such partners might include Australia, India, NATO, and the European Union, among others. These are logical partners, inasmuch as they rely heavily on the stability of maritime trade routes through the East and South China Seas.

Third, American policy makers must realize that the contest for East Asia is one of both power and law. International law supports and legitimizes the exercise of American power. It ensures that the landscape of domestic and international opinion is favorable to American objectives, policies, and actions. International law of the sea in particular, through its assurances of freedom of navigation for security as well as commercial purposes, supports the continued nature of East Asia as a maritime system. International law regarding the free use of international airspace operates similarly. Accordingly, to ensure its future position in East Asia the United States should take specific actions to defend the international legal architecture pertaining to the maritime and aerial commons. Acceding to the United Nations Convention on the Law of the Sea and once again exercising direct leadership over the development of its rules and norms is the first and most critical step. The Department of State should also reenergize its Limits in the Seas series to reinforce, publicly and repeatedly, international law related to sea and airspace. A good place to begin the new series would be with a detailed assessment of why international law explicitly rejects China's "U-shaped line" in the South China Sea as the basis for Chinese jurisdiction there. Others could be written to describe why China's East China Sea continental-shelf claim misapplies international law and why China's ADIZ unlawfully asserts jurisdiction in the airspace. My sense is that East Asian states, indeed many states around the world, are desperate for active American leadership with regard to the norms and laws that govern legitimate international action.

Finally, the United States should accept China's outstretched hand concerning a "new-type great-power relationship" and actively engage at all levels in discussions about what it might look like. If there is some way to find a new security paradigm, the United States and China owe it to each other and to the world to find it. My strong sense is that this new, third path is already apparent. That path lies in the further advancement of the economic and security institutions, international law, and norms of acceptable behavior that arose out of the ashes of old-type great-power relationships of the nineteenth and twentieth centuries. Revitalizing and further developing these institutions with full Chinese partnership

is the pathway to strong, stable, and vibrant regional and global systems in the coming decades.

PETER A. DUTTON

Professor Dutton, director of the China Maritime Studies Institute at the Naval War College, publishes and lectures widely on American and Chinese views of sovereignty and international law of the sea and on the strategic implications to the United States of Chinese international law and policy choices. He also researches and lectures on international law of the sea issues in the East and South China Seas, East and Southeast Asia, the Arctic, the Proliferation Security Initiative, and maritime strategy. A retired Navy Judge Advocate, he holds a juris doctor from the College of William and Mary and a master of arts (with distinction) from the Naval War College and is pursuing a PhD at King's College London.

The opinions expressed herein are the personal views of the author and are not meant to represent the official views of the Department of the Navy or any other agency of the federal government. The text differs in minor ways from that published online by the House Foreign Affairs Committee.

Rear Admiral Walter E. "Ted" Carter, Jr., became the fifty-fourth President of the U.S. Naval War College on 2 July 2013. A native of Burrillville, Rhode Island, he graduated from the U.S. Naval Academy in 1981, was designated a Naval Flight Officer in 1982, and graduated from Top Gun in 1985.

His career as an aviator includes sea assignments in Fighter Squadron (VF) 161, on board USS Midway *(CV 41); in VF-21, the "Freelancers," on board USS* Independence *(CV 62); in Carrier Air Wing Five (CVW 5); in command of the VF-14 "Tophatters"; and as executive officer of USS* Harry S. Truman *(CVN 75), culminating in command of USS* Camden *(AOE 2) and USS* Carl Vinson *(CVN 70). Subsequent fleet command assignment includes service as Commander,* Enterprise *Carrier Strike Group (CSG 12).*

Carter has served in numerous shore assignments, including VF-124, the "Gunslingers"; in Fighter Wing Pacific; as executive assistant to the Deputy Commander, U.S. Central Command; as chief of staff of the Joint Warfighting Center, U.S. Joint Forces Command; as Commander, Joint Enabling Capabilities Command; and as Director, 21st Century Sailor Office (N17).

He has led strategic projects, including the disestablishment of U.S. Joint Forces Command, and most recently, was charged with leading Task Force RESILIENT.

He is the recipient of various personal awards, including the Defense Superior Service Medal (two awards), Legion of Merit (three awards), Distinguished Flying Cross with Combat V, Bronze Star, Air Medal (two with Combat V and five strike/flight), and Navy and Marine Corps Commendation Medal (two with Combat V). He was also awarded the Vice Admiral James Bond Stockdale Leadership Award and the U.S. Navy League's John Paul Jones Award for Inspirational Leadership and was appointed an Honorary Master Chief by the Master Chief Petty Officer of the Navy.

He has accumulated 6,150 flight hours in F-4, F-14, and F-18 aircraft and has made 2,016 carrier-arrested landings, the record among all active and retired U.S. naval aviation designators. He has also flown 125 combat missions in support of joint operations.

PRESIDENT'S FORUM

Setting the Conditions for Strategic Thought

SINCE 1884, THE NAVAL WAR COLLEGE has existed as a place to study and understand the complexity of conflict. As it prepares to celebrate its 130th anniversary, the College continues to refine its educational and research programs to meet the demands of the Navy and the national security community. The Naval War College is helping to prepare and shape the Navy of Tomorrow; and we are significantly supporting the Navy of Today.

The Navy of Tomorrow. A classic Asian proverb holds, *If you are planning for one year, sow rice; if you are planning for a decade, plant trees; if you are planning for a lifetime, educate people.* NWC is committed to helping ensure that America's future military leaders are prepared to meet the challenges of the next decade and beyond. We at the College want and need to change as the global environment evolves, while reinforcing the successful initiatives and activities that have brought us to the high level of success we currently enjoy. The College continues to refine and enhance its resident and nonresident curricula to keep abreast of the evolving national security environment and fulfill the needs of future naval leaders and our joint forces. Moreover, we are expanding our reach to the entire Navy officer and enlisted ranks, while doing more to serve fleet commanders through tailored special programs. Refined course content, new course names, and awarding of two separate degrees will complete the course bifurcation process begun a decade ago and provide our graduates with education and the academic credentials clearly in line with their academic efforts.

The Navy of Today. A number of programs and initiatives focus on nearer-term outcomes. One example is the establishment of the Naval Leadership and Ethics Center (NLEC) as an operating unit of the Naval War College. This

new organizational entity, an expansion and modernization of the former Navy Command Leadership School (CLS), will become the Navy's primary location for training and educating officers and enlisted across all warfare communities, staff corps, and subspecialties in a wide range of leadership and ethical issues. All of the College's programs and many of the NLEC curricula focus on reinforcing the "Desired Leader Attributes" identified by the Chairman of the Joint Chiefs of Staff, General Martin Dempsey. The military's leaders must have the ability to understand the environment and the effects of all instruments of national power; to anticipate and adapt to surprise and uncertainty; to recognize change and lead transitions; to operate with commander's intent through trust, empowerment, and understanding; to make ethical decisions based on the shared values of the profession of arms; and to think critically in applying joint warfighting principles and concepts to joint operations. In describing the value of Professional Military Education (PME), General Dempsey has said, "We can't underinvest in professional military education or we will suffer challenges in the future. You just mortgage your future when you underinvest in professional military education."

In the College's intellectually stimulating environment, students can channel their minds into consideration of issues well beyond the platform or service level. They can step out of their comfort zones, and through their written papers, war games, and class presentations put forth creative solutions to complex problems. They can help reduce future strategic surprise by sharing ideas and subjecting them to the sometimes vehement critiques of peers and mentors. The genesis of a bold new idea is rarely evident at first glance. The creative process is much like the skills necessary to breathe life into a fire at a cold mountain campsite—a single spark, introduced into an environment with dry tinder and sufficient fuel, can be nurtured into a roaring fire. In a similar manner, the Naval War College is all about creating the conditions in which creative sparks can grow into strategic concepts that will help our Navy better serve the nation.

The period between the world wars is often referred to as the College's "golden era," when most of the senior naval officers who would ultimately win World War II in the Pacific spent time in Newport studying the many potential futures they were likely to face. We now find ourselves in a similar period, having drawn down from a dozen years of complex irregular conflict, and I strongly believe that naval and all military officers should now invest in themselves to improve further their ability to think strategically and contribute to the needs of the joint force of the future. A Naval War College education, in residence or via one of our excellent nonresident programs, should be in every officer's career plan. It is widely recognized that the Navy excels in training our sailors to understand and react to events they are likely to face—training for the *known* eventualities. Education, on the other hand, develops our sailors' critical analysis and

cognitive skills to help them deal with the unexpected and the *unknown*. This powerful combination of training and education, reinforced by real-world experience, equips us for success in the future.

WALTER E. "TED" CARTER, JR.
Rear Admiral, U.S. Navy
President, Naval War College

Dr. Maurer is the Alfred Thayer Mahan Professor of Sea Power and Grand Strategy and served as the chair of the Strategy and Policy Department at the Naval War College in Newport, Rhode Island. A graduate of Yale University, he is the author or editor of books examining the outbreak of the First World War, military interventions in the developing world, naval arms control between the two world wars, and a study about Winston Churchill's views on British foreign policy and grand strategy. He served on the Secretary of the Navy's advisory committee on naval history and has received both the U.S. Navy's Meritorious Civilian Service Award and the Superior Civilian Service Award. At the Naval War College, he teaches a popular elective course on Churchill and grand strategy.

AVERTING THE GREAT WAR?

Churchill's Naval Holiday

John H. Maurer

Winston Churchill is best remembered as a valiant leader in times of war. He should also be remembered, however, for his efforts to prevent the catastrophic great wars that would scar the history of the twentieth century. While it is largely forgotten today, on the eve of the First World War Churchill made a remarkable attempt to halt the head-to-head competition in naval armaments that was setting Great Britain and Germany against one another as adversaries. In a bold and unconventional initiative, Churchill invited Germany's rulers to take a "holiday" from the competitive building of battleships. As the civilian head of Britain's Royal Navy, Churchill made public appeals for a naval holiday on three separate occasions before 1914. Behind the scenes too he pressed for the opening of negotiations with Germany, using the holiday proposal as the starting point for discussions. It was Churchill's earnest hope that the naval holiday would stop the action-reaction dynamic of the arms race—what statesmen of that era called "the sea war waged in the dockyards"—and reduce the antagonism between Britain and Germany.[1] Rather than letting Britain and Germany be arrayed in opposing camps, he wanted to promote cooperation between Europe's two leading great powers.

But these hopes were to be disappointed. While Churchill's advocacy of a shipbuilding holiday generated a great deal of commentary in the press and discussion among statesmen, it utterly failed as a practical measure to arrest the naval arms race. Germany's rulers rejected the proposal. The holiday scheme also came under heavy criticism at home, from opposition political leaders, a hostile press, and even within the British government. The Conservative political opposition labeled Churchill's plan unworkable, while Britain's foreign-policy decision makers stood against arms-control negotiations with Germany. Confronted by stiff opposition both at home and abroad, Churchill's holiday proposal was stillborn.

In retrospect, it appears that a naval holiday stood little chance of success. The noted historian A. J. P. Taylor held the view that "probably only Churchill took it seriously." But that was not the case. Germany's leaders saw the proposal as a challenge to their attempt to build up a powerful navy to rival that of Britain. The German ambassador in Britain, Prince Karl Max Lichnowsky, reported that Churchill "meant the naval holiday to be taken completely seriously and he considered the idea as entirely practicable."[2] Churchill was a realist, recognizing that serious impediments stood in the way of achieving his aim. Nonetheless, he argued that it was "a profound British interest to procure a halt" in the arms competition.[3]

I

Winston Churchill became first lord of the Admiralty during the autumn of 1911, a time when the rise of German naval power posed an immense threat to Britain's security. The previous summer, when Germany had provoked an international showdown with France over Morocco—the so-called Agadir (or Second Moroccan) Crisis—Britain's leaders had even feared at one point in the confrontation that a war might erupt, with the German navy launching a surprise attack on the British fleet, scattered among its peacetime bases in home waters. As the civilian head of the Royal Navy, the government minister responsible for supervising Britain's naval defense efforts, Churchill was determined to prevent Germany from defeating Britain at sea. "Of all the dangers that menaced the British Empire," Churchill would later write, "none was comparable to a surprise of the Fleet. If the Fleet or any vital part of it were caught unawares or unready and our naval preponderance destroyed, we had lost the war, and there was no limit to the evils which might have been inflicted upon us." In Churchill's estimation, Germany's battle fleet, concentrated in German home waters just across the North Sea from Britain, poised to launch a first-strike surprise attack, represented an "ever-present danger."[4]

Churchill's determination to ensure Britain's naval preparedness for war did not mean that he considered a conflict between Britain and Germany inevitable. "I do not believe," he told a political associate, "in the theory of inevitable wars."[5] Churchill held the firm conviction that war would serve neither country's best interests. In a speech Churchill delivered in 1908, he derided the notion that the rivalry between the two countries pointed toward a clash of arms. "I think it is greatly to be deprecated," he stated,

> that persons should try to spread the belief in this country that war between Great Britain and Germany is inevitable. It is all nonsense. . . . [T]here is no collision of primary interests—big, important interests—between Great Britain and Germany in any quarter of the globe. . . . Look at it from any point of view you like, and I say you will come to the conclusion in regard to relations between England and Germany, that

> there is no real cause of difference between them, and . . . these two great people[s] have nothing to fight about, have no prize to fight for, and have no place to fight in.[6]

Instead of impending conflict, Churchill looked forward to "the peaceful development of European politics in the next twenty years." This period of peace would be the result of "the blessed intercourse of trade and commerce[, which] is binding the nations together against their wills, in spite of their wills, unconsciously, irresistibly, and unceasingly weaving them together into one solid interdependent mass." What Churchill called "the prosaic bonds of commerce" were dampening international crises, promoting the peaceful settlement of disputes between "civilized and commercial States." The danger of international economic collapse, he contended, imposed "an effective caution and restraint even upon the most reckless and the most intemperate of statesmen." To buttress his point of view Churchill could point to the fact that during the previous forty years "no two highly-organized commercial Powers have drawn the sword upon one another."[7] Before becoming first lord of the Admiralty, Churchill thus downplayed the likelihood of a war between Britain and Germany.

The relentless buildup of the German battle fleet, along with Berlin's rude unwillingness to reduce its naval program, however, led Churchill reluctantly to conclude that the ambitions harbored by Germany's leaders did indeed pose a serious threat to the peace of Europe. The naval competition between Britain and Germany before the First World War is often considered the classic example of an arms race.[8] In particular, the years between 1906 and 1912 witnessed an intense head-to-head competition between the two powers in the building of modern capital ships—that is, battleships and armored (or battle) cruisers, the largest, most powerfully armed surface ships. During this six-year period Britain launched twenty-nine capital ships and Germany seventeen. Naval expenditures in both countries soared to pay for this arms buildup; Germany's naval budget practically doubled, while Britain's naval estimates increased by over 40 percent.[9] Churchill thought: "The determination of the greatest military Power on the [European] Continent to become at the same time at least the second naval Power was an event of first magnitude in world affairs."[10] Churchill bluntly expressed these views in conversations with the German ambassador: "It was no good shutting one's eyes to facts," he stated, "and that however hard Governments and individuals worked to make a spirit of real trust and confidence between two countries they would make very little headway while there was a continually booming naval policy in Germany."[11] The buildup of a German battle fleet, consciously designed by Germany's leaders to undermine Britain's security, stood as a major obstacle to cooperation between the two countries. Germany could remove this obstacle, reducing the danger of war and improving relations with Britain, by dropping its naval challenge.

When Churchill took office as first lord of the Admiralty, he held the aim of carrying out a program of warship construction to give Britain a clear lead in the arms race. The number of battleships built by Britain would be based on German naval construction. Thus, if Germany increased its battleship construction, Britain would automatically follow suit and outstrip the German effort. This strategy, Churchill thought, would impress on Germany's leaders the futility of trying to overcome Britain's naval lead. "Nothing, in my opinion," Churchill wrote, "would more surely dishearten Germany, than the certain proof that as the result of all her present and prospective efforts she will only be more hopelessly behindhand."[12] Churchill's fundamental goal as first lord was to ensure that Britain remained decisively ahead of Germany in the naval competition. To the famous newspaper editor J. L. Garvin, Churchill wrote, "As long as we do not relax our exertions, and proceed on the sober lines I have laid down, we shall—in absence of any new development—break these fellows' hearts in peace or their necks in war."[13]

The German government viewed the holiday scheme as an attempt at political warfare.

By frustrating Germany's naval ambitions, Churchill aimed to make Berlin more amenable to a settlement of outstanding differences between the two countries. To the famous admiral Lord "Jackie" Fisher, Churchill maintained that British naval construction could be changed to permit "England and Germany to agree upon proportionate reductions."[14] Winning the naval arms race was not an end in itself but a way to convince the German government that cooperation with Britain would provide the basis for a more secure international environment and benefit the core interests of both countries.

To unveil his holiday proposal, Churchill chose a dramatic setting, the annual presentation by the first lord of the Admiralty to Parliament of the government's naval spending requirements for the upcoming year. Interest in Churchill's speech had been heightened by rumors of impending increases in Germany's shipbuilding program, presaging another costly round in the Anglo-German naval arms race, and by the fact that it was his first presentation of navy estimates since becoming first lord the previous October. Churchill did not disappoint his listeners. Before a packed House of Commons on 18 March 1912, he bluntly declared that Britain's naval efforts were directed at defeating Germany's challenge. He outlined the government's intention to execute a program of naval construction linked to German shipbuilding. Furthermore, Churchill warned Berlin that if it added more capital ships to its existing program, Britain would respond by further increases in its own. For every additional capital ship started by Germany, the first lord declared, Britain would build two. In this way Churchill stated the clear intention of Britain to keep ahead of Germany in the naval race.

Churchill coupled this warning to Berlin with his offer of a naval holiday. To break the competition in shipbuilding Churchill called for the introduction of "a blank page in the book of misunderstanding" between Britain and Germany. "Any retardation or reduction in German construction," he declared, "will . . . be promptly followed here . . . by large and fully proportioned reductions." In the year 1913, for instance, it was anticipated that Germany would start construction of three capital ships. If Germany dropped this annual contingent of ships from its program, Britain would "blot out" the corresponding five capital ships it planned to start that year. "The three ships that she [Germany] did not build," Churchill told the House of Commons, "would therefore automatically wipe out no fewer than five British potential super-'Dreadnoughts,' [that is, the latest generation of battleships] and that is more than I expect them to hope to do in a brilliant naval action." By taking a holiday from building for a year or even two, Germany would obtain substantial savings in naval expenditure. Churchill concluded: "Here, then, is a perfectly plain and simple plan of arrangement whereby without diplomatic negotiation, without any bargaining, without the slightest restriction upon the sovereign freedom of either Power, this keen and costly naval rivalry can be at any time abated."[15]

Germany's rulers found no merit in Churchill's proposal. The kaiser sent Churchill a "courteous" message that a naval holiday "would only be possible between allies."[16] To his intimates the kaiser was much less courteous: he branded Churchill's speech "arrogant." Germany's Chancellor Theobald von Bethmann Hollweg also dismissed Churchill's initiative. "Churchill's speech did not come up to my expectations," Bethmann Hollweg wrote; "he really seems to be a firebrand past praying for."[17] Germany's leaders deemed Churchill's offer unacceptable, declining to see it as a serious proposal that required an official response.

Berlin's refusal to consider the holiday proposal did not deter Churchill, who remained committed to putting the idea into practice. He asserted that Britain "ought never to allow the discussion of this vital question to be stifled just because it is unwelcome to the ruling classes in Germany."[18] Churchill had a further reason to renew the offer for a naval holiday. Toward the end of 1912, the Admiralty received intelligence indicating that Germany intended another increase in naval construction.[19] If Germany did build additional battleships, that would entail increases in British naval spending. To deter their construction, Churchill repeated the holiday proposal on two separate occasions during 1913. On 26 March, once again in the presentation of navy estimates to Parliament, Churchill offered to drop the four battleships Britain would begin during 1914 if Germany canceled or delayed the two capital ships it was scheduled to start. It was Churchill's opinion that under these circumstances a "mutual cessation [of battleship building] could clearly be no disadvantage to the relative position" of Germany.[20]

Berlin officially responded this time to Churchill's call in the form of a statement by Bethmann Hollweg to the Reichstag that Germany had yet to receive formal proposals from the British government. Bethmann Hollweg's response, however, was disingenuous: in public, the German government appeared willing to entertain British arms-control proposals; behind the scenes, Germany's leaders worked to discourage an offer based on the holiday scheme.[21] Berlin instructed Lichnowsky to tell Sir Edward Grey, Britain's foreign secretary, in private discussion that it did not welcome further public mention of the holiday proposal.[22] The kaiser bluntly made it known that he took personal affront at the holiday scheme and did not want it raised again. The British ambassador in Berlin reported, "The Emperor said that he did not wish to make a fuss, but that he wished his words repeated quietly and privately in the proper quarter."[23] Meanwhile, Germany's navy secretary, Admiral Alfred von Tirpitz, went even farther, trying to play on British fears that Anglo-German relations would deteriorate, rather than improve, if Churchill persisted in pursuing his scheme. He told the German naval attaché in London to say to British leaders "that Churchill can now only injure the tender plant of a German-English détente by his holiday proposal."[24] When the German naval attaché reported back in the spring of 1913 that Churchill intended nonetheless to renew the holiday offer later in the year, Germany's leaders braced themselves to reject it. The kaiser wrote on the attaché's message, "We are on our guard!"[25]

The German naval attaché's information proved correct; Churchill repeated the holiday proposal in a speech in Manchester on 18 October 1913. In this speech Churchill gave the fullest public account of what he meant by the holiday proposal. He observed that Britain would start building four new battleships during the coming year, while Germany was scheduled to begin two capital ships. If Germany dropped its two capital ships, Britain would delete four battleships. According to Churchill's calculations, Britain would save twelve million pounds and Germany six million over the following three years if these ships were never built.[26]

The repetition of Churchill's offer created a storm of protest in Germany. Sir Edward Goschen, the British ambassador in Berlin, reported that the holiday proposal had received coverage "in all the more important German newspapers and has been received with almost universal disapproval." In the assessment of the British embassy, the only difference between German newspapers "lies in the varying degrees of politeness or rudeness with which they refuse even to consider the holiday year suggestion." For example, Count Ernst von Reventlow, the prominent foreign-affairs editor of the conservative *Deutsche Tageszeitung,* blasted Churchill, saying that Britain's first lord should take a holiday from making speeches.[27]

The German government itself waited almost four months before responding to Churchill. In February 1914, Tirpitz explicitly rejected the holiday proposal in a speech to the budget committee of the Reichstag, stating that Germany's leaders did not consider Churchill's speeches to constitute an official offer. Tirpitz told the Reichstag deputies that he had read about the holiday proposal "in the newspapers, for I have received no further intimation of the matter." Furthermore, Tirpitz made plain that if the British government officially put forward the holiday plan as the basis for arms-control negotiations, Berlin would reject it.[28] German decision makers wanted to shunt arms control to the sidelines in their dealings with Britain. German policy was made clear by Lichnowsky, who told British leaders that Germany sought to create "a thoroughly good and healthy atmosphere between the two countries and then they would see that it was perfectly absurd to continue this competitive race in defensive arms."[29] In Lichnowsky's opinion, "it was possible to arrive at an understanding *in spite of the [German] fleet* and without a 'Naval holiday.'"[30] Before German decision makers would agree to limits on naval building, they wanted a political understanding with Britain to improve Germany's strategic position.

"There is no real cause of difference between [England and Germany], and . . . these two great people[s] have nothing to fight about, have no prize to fight for, and have no place to fight in."

The German government viewed the holiday scheme as an attempt at political warfare. Goschen in Berlin noted that Germany's leaders "cannot get it out of their heads . . . that in proposing the Naval Holiday the First Lord has something up his sleeve, something that would be advantageous for the British, and detrimental to the German Navy."[31] Germany's rulers were particularly suspicious of Churchill. Tirpitz considered Churchill an "extraordinarily energetic English navy minister," committed to defeating Germany's naval challenge.[32] Berlin viewed British arms-control efforts as an attempt to paralyze the growth of the German battle fleet and limit Germany's aspirations to achieve world-power status. In his memoirs, Tirpitz complained of the "untiring efforts of British diplomacy[,] . . . [which] aimed . . . at sickening us of the fleet, and at picking holes in the Navy Bill, if possible in order to wreck it."[33]

Churchill's speeches infuriated the kaiser and Germany's naval leaders. Among the German leadership, he had acquired the reputation of a bully. The German naval attaché, Captain Erich von Müller, reporting on Churchill's presentation of the Admiralty's spending requests to the House of Commons in March 1914, commented, "Mr. Churchill departed from his former habit, and in his speech this year avoided making hostile remarks about the German Navy."

Müller thought that Churchill had changed his tone only because he "realizes that his former habit of 'plain speaking' resulted in the opposite of the intimidation that he hoped for." In Müller's assessment, Churchill now wanted to avoid in his speeches provoking Germany into the construction of additional warships, permitting Britain to take advantage of the slower rate of German naval building.[34] Müller's report illustrates how Germany's leaders viewed Churchill as habitual in his rudeness when speaking about the German navy and able to break this habit only when he intended some deception.

Tirpitz feared that arms-control proposals emanating from Britain might give an opening to domestic political opponents who opposed his program of battleship building. Inside the German government Tirpitz faced determined opposition to his naval policy. Bethmann Hollweg and the Foreign Office, for example, wanted to curtail shipbuilding as part of their diplomacy to improve relations with Britain. To them, battleships were bargaining chips—not so to Tirpitz, who saw the battle fleet as the instrument to improve Germany's security and international standing against a hostile Britain. In addition, successive German treasury officials wanted to trim the navy's budget, which they viewed as too costly. Treasury secretary Adolph Wermuth resigned from the government in 1912 rather than go along with increases in German naval spending. His successor, Hermann Kühn, proved just as resolute in holding down spending on the German navy. These internal opponents posed a constant threat to the execution of Tirpitz's plan to build a battle fleet against Britain.

Tirpitz also feared that the holiday scheme might galvanize opposition within the Reichstag. In the late spring of 1913, Tirpitz complained that "the defense proposals with their immense demands on the German taxpayer, and . . . the general demand for a lasting understanding with England will pave the way for Churchill's plans." The navy secretary thought that "the mood in the Reichstag is . . . not now so unfavorable toward [a naval holiday]."[35] As a consequence of the general elections held in January 1912, the Social Democrats emerged as the largest party in the Reichstag, and they opposed increases in naval spending. Another consideration was that a naval holiday might dislocate the German shipbuilding industry, bringing about an increase in unemployment and social unrest.[36] From Tirpitz's perspective, Churchill's public arms-control appeals were aimed at undermining domestic political support for the German government's naval policy.

Churchill faced an implacable foe in Tirpitz. When Colonel Edward House, the confidant of President Woodrow Wilson, met Tirpitz in Berlin during the spring of 1914, he recorded in his diary that the German navy secretary "evidenced a decided dislike for the British, a dislike that almost amounted to hatred."[37] Tirpitz and the Imperial Navy Office showed no interest in the plan, except to find a way to defeat it. The holiday plan threatened Tirpitz's life's work of rivaling Britain at

sea by steadily building up German naval power. He believed that a naval holiday would upset timetables for warship construction and escalate shipbuilding costs, while increasing the likelihood of political confrontations over defense spending within the German government and with the Reichstag. Rather than go along with the holiday proposal, Tirpitz would have resigned from office. Tirpitz's determined opposition posed a serious impediment to reaching an arms-control agreement, blocking efforts within the German government to reach a settlement with Britain.

Behind Tirpitz stood the kaiser. The German naval buildup was the kaiser's creation. A powerful navy was the settled ambition of the kaiser, and he showed considerable rudeness to anyone who wanted to curtail it. Within Germany's ruling oligarchy, the kaiser consistently sided with Tirpitz when disagreements occurred over armaments programs, strategy, or foreign policy. He pushed for the building of additional warships even in the spring of 1914, after Tirpitz had concluded that further construction would prove counterproductive, only strengthening Churchill's ability to keep Britain ahead of Germany in the arms race. The kaiser, despite considerable evidence and advice to the contrary, discounted the baneful contribution of the naval buildup to the deterioration of Germany's strategic situation. "If England only intends to extend her hand to us under the condition that we must limit our fleet," the kaiser declared, "that is an unbounded impudence which contains in it a bad insult to the German people and their Emperor. This offer must be rejected *a limine* [i.e., at the outset]." The kaiser was strident in making plain his views about arms control: "I have shown the English that, when they touch our armaments, they bite on granite. Perhaps by this I have increased their hatred but won their respect."[38] Given the kaiser's attitude, Churchill did not have in him a willing negotiating partner.

II

Opposition to a naval holiday was not confined to Germany; political opponents at home attacked Churchill as well. Arthur Lee, the principal spokesman on naval matters for the opposition Tories, "saw almost insuperable obstacles in the way of any attempt to carry that into practice."[39] The opposition press also blasted Churchill. The *National Review* thought it "really stupefying" that the Liberal government appeared obsessed with "the Disarmament craze," and it poured scorn on "the mountebank at the Admiralty" (that is, Churchill) for his "platform performances[, which] are as idiotic to us as they are offensive to Germany, and play into the hands of the vast army of Anglophobes [in Germany] who preach a *jehad* against this country. Politicians of this calibre will say anything to get themselves reported."[40] Critics of the plan considered it undignified for Britain to repeat an offer that Germany had already spurned. In the view of critics, by

repeating the offer Churchill only encouraged Germany's leaders to think that Britain might tire of the naval competition.[41]

The permanent staff at the Foreign Office and Britain's high-level diplomats also objected to the idea of pursuing arms-control discussions with Germany. Eyre Crowe, assistant under-secretary of state for foreign affairs, thought that any arms-control proposal put forward by Britain would "not be treated straight-forwardly in the negotiation, and I regard any such negotiation with so unscrupulous an adversary as highly dangerous."[42] Meanwhile, Goschen in Berlin observed, "One cannot help thinking that a determined execution of what [Churchill] outlined in 1912 [to keep decisively ahead of Germany] would have a far greater effect upon German shipbuilding than what he has now done." In Goschen's opinion, "the best way of taking the wind out of the sails of the Big Navy Party in Germany is to state frankly that if threatened with further efforts to reduce our supremacy we shall make a big effort, by loan if necessary, to render that supremacy unassailable."[43] The Foreign Office staff and British diplomats thus held the same opinion as their German counterparts that arms control should be moved to the sidelines. In Goschen's opinion, Churchill should not renew the holiday proposal. Britain's King George V concurred with the view of his cousin the kaiser that Churchill drop the search for an arms-control agreement, adding to Goschen's report: *"I entirely agree with the hope expressed by the Emperor."*[44]

Domestic political imperatives, nonetheless, had played a large part in moving Churchill to make the holiday proposal. Churchill needed to forge a consensus among the governing Liberals on naval spending, which caused considerable dissension within the party. Arms control reassured rank-and-file party members that the government was doing everything in its power to dampen the naval rivalry and pin responsibility for the competition squarely on Berlin. Both in Britain and on the Continent, many political commentators regarded Churchill's plan as an attempt to appease radicals within the Liberal Party who opposed increased naval spending. After Churchill's speech in Manchester, for example, the response of the influential Lord Esher was typical: "Winston was playing to the radical gallery in his recent speech, as it is inconceivable that so clever a fellow should have been silly enough to imagine that he had any chance of obtaining a favourable reply."[45]

That Churchill's holiday plan was aimed at a domestic political audience as well as Germany should not be surprising. Germany's naval challenge posed a painful dilemma for Britain's Liberal government: either to spend ever larger amounts to keep ahead of Germany or to relinquish the country's superiority at sea. Given these options, Britain's decision makers ultimately chose to increase naval spending. During the Liberal government's tenure of office, naval spending increased by over eighteen million pounds.[46] But this choice did not sit well

with British Liberals, who found the rapidly escalating cost of naval defense an appalling waste. To David Lloyd George, Britain's dynamic chancellor of the exchequer, the arms competition made no sense—it amounted to "organised insanity." Lloyd George received considerable support among fellow Liberals when he pressed Churchill for reductions in the Admiralty's spending during the winter of 1913–14.[47] The complex interplay of domestic political and strategic factors required that Churchill secure acceptance of his naval building program within the government and the Liberal Party at large. Arms control enabled him to reconcile fellow Liberals with the Admiralty's efforts to stay ahead of Germany in the naval competition.

III

In the spring of 1914, when the prospects for the holiday proposal seemed finished, an incredible opportunity suddenly presented itself to Churchill for the resumption of face-to-face arms-control talks with Germany's rulers. The occasion was an upcoming visit to Kiel by a squadron of British battleships invited by the German government to take part in that city's annual regatta. If Churchill accompanied the warships, he could meet with the kaiser and Tirpitz, who attended these annual festivities.

Albert Ballin, the German shipping magnate, director of the Hamburg-America Line, and intimate of the kaiser, acted as an intermediary in obtaining an invitation for Churchill to accompany the British squadron. Ballin had already served as a go-between to bring together the two countries' leaders. According to his biographer, Ballin "clung to his favourite idea that the naval experts of both countries should come to an understanding."[48] Working outside official government channels, Ballin reached out to Sir Ernest Cassel, an influential banker and friend of Churchill. Ballin and Cassel wanted to arrange a meeting between Churchill and Tirpitz. Both men knew that Churchill would welcome the opportunity to take part in negotiations designed to reduce the naval rivalry and thereby strengthen the détente then emerging between the two countries. Before proceeding, however, Churchill questioned "whether Tirpitz really wanted to see me and have a talk." Cassel assured him that "this was so."[49] Encouraged by Ballin and Cassel, Churchill moved to open direct, high-level talks with Germany's leaders.

Despite the assurances of Ballin and Cassel, however, the German government showed no interest in renewed negotiations. Only the year before the kaiser had gone out of his way to prevent a visit by Churchill to Germany. The kaiser had feared that Churchill, even without a formal invitation, might show up at that year's celebrations at Kiel. In a brutally frank conversation with the British naval attaché, the kaiser "remarked very decidedly that he had *not* asked the First Lord to the Kiel regatta, but that the First Lord seemed to have a habit of turning up

uninvited, as he had done at the Kaiser Manoeuvres." The British naval attaché also duly recorded: "The Emperor remarked that he did not know how to take the First Lord, what he said to him he thought Mr. Churchill transposed later. He was a man who could not be trusted." The kaiser also described as a "fiasco" a visit to Germany in 1912 by Lord Haldane, who had tried to arrange a naval settlement at the initiative of Ballin and Cassel.[50] The kaiser's cutting remarks had stopped any notion that Churchill might come to Kiel during 1913.

In the spring of 1914, however, the prospective arrival of British battleships—a visit the German government wanted—made it difficult for the kaiser to reject out of hand an attempt by Churchill to come along as well. "An invitation would not be opportune," the kaiser instructed the German Foreign Office, "but he [that is, the kaiser] is convinced that an official enquiry by the British as to whether Mr. Churchill and his colleagues in the Admiralty would be welcome . . . would be received with pleasure."[51] The kaiser, making a virtue out of necessity, even offered an invitation to Churchill through his brother, Prince Henry. "The Emperor wishes it to be understood," Prince Henry told the British ambassador in Berlin, "that he has invited the First Lord of the Admiralty and the Sea Lords to Kiel officially, and that he hoped that at all events both Mr. Churchill and Prince Louis of Battenberg [the first sea lord] would be present during the Kiel week."[52] The British naval attaché also reported to Churchill from Berlin:

> [Prince Henry] wanted me to convey to you clearly . . . that the Emperor will undoubtedly be hurt if you and at least another of the Board do not appear. Prince Henry indicated that the Emperor would like to welcome H.R.H. Prince Louis of Battenberg, and gave me to understand that His Majesty is straightforwardly anxious to exhibit every friendliness on this occasion.
>
> To make a long story short, what is evidently hoped for is that you and the First Sea Lord will both be at KIEL *in the "Enchantress"* [the Admiralty yacht].[53]

The back-channel diplomatic connection of Ballin and Cassel worked, and Churchill duly received an invitation to visit Germany.

To guide the anticipated negotiations, Churchill worked up a four-point arms-control agenda. At the top of his list was a discussion of the holiday proposal. Churchill also thought that room for agreement might exist with regard to limitations in the size of capital ships. In addition, Churchill wanted to explore ways to reduce the danger of surprise attack. He proposed finding means to reduce "the unwholesome concentration of fleets in Home Waters." With a reduction in the readiness of the main British and German fleets to launch concentrated offensive strikes, both sides would have less to fear from the hair-trigger danger of surprise attack. Another topic for discussion was the development of confidence-building measures—that is, formal procedures for mutual inspections—which "would go

a long way to stopping the espionage on both sides which is the continued cause of suspicion and ill-feeling." Churchill would later write that these topics, if discussed and "agreed upon, would make for easement and stability."[54]

Given the attitude of Germany's leaders, however, Churchill's agenda stood no prospect for success. No genuine willingness existed on the part of the kaiser or Tirpitz to reduce their naval program. Quite the reverse was actually the case; both wanted to make additions to German naval strength during the spring of 1914. The kaiser, for instance, pressed for the construction of an extra battleship. Meanwhile, Tirpitz's staff wanted to increase the readiness of the German fleet, so that it could carry out a "lightning-fast offensive." To increase both the combat power of German ships and the fleet's readiness, Tirpitz asked for an extra 150–200 million marks over and above the budget already allotted. Bethmann Hollweg, citing both diplomatic and financial considerations, fended off these requests.[55] Nonetheless, these discussions among German decision makers clearly show that neither the kaiser nor Tirpitz looked to slacken the pace of the competition or seek an accommodation on the naval rivalry. Both were only waiting for a suitable occasion to beat down Bethmann Hollweg's opposition and increase the threat posed by the German fleet to Britain.

In a bold and unconventional initiative, Churchill invited Germany's rulers to take a "holiday" from the competitive building of battleships.

Meanwhile, the kaiser's adamant opposition to arms-control negotiations could not have been clearer. He wrote Bethmann Hollweg in the winter of 1914, "I wish to see the whole endless and dangerous subject of limitation of armaments rolled up and put away for good. What it comes to finally is that England is protesting against my right to decide on the sea power required by Germany."[56] Germany's foreign secretary, Gottlieb von Jagow, bluntly told Goschen that "the [naval holiday] idea is Utopian and unworkable." Goschen held the view that "Winston Churchill's proposal that there should be a 'year's inactivity in Naval construction' for everybody is not liked here—ostensibly because the idea is unworkable—but really I expect, because it is an offer which they can't very well accept—and which may make them liable to be told later by us—'We have made you an offer and you wouldn't accept it.'"[57] Goschen correctly concluded that the German government had no real intention of considering the holiday proposal as a basis for negotiation.

Lichnowsky too, reporting back from London to his government about the prospect of Churchill's visit to Kiel, opposed a renewal of arms-control discussions in any upcoming talks. On 10 May 1914 Lichnowsky passed on that Churchill "will probably come [to Kiel] on board his yacht, accompanied by a few

Sea Lords and his beautiful and charming wife." Lichnowsky warned his superiors, "Churchill is an exceedingly crafty fox and is sure to try to spring some proposal or other on us. . . . As a politician he is somewhat fantastic and unreliable."[58] Nevertheless, at the end of May Lichnowsky hazarded the opinion that if the first lord did go to Kiel, "I cannot imagine that it would do any harm, unless we start discussing unnecessary stuff with him." By "unnecessary stuff" Lichnowsky meant negotiations about the naval rivalry. Lichnowsky volunteered to warn Churchill "that it would be better for him not to refer to the naval holiday or other nonsense of that kind."[59] One can imagine Churchill's response to Lichnowsky's characterization of his holiday proposal—the number-one item on his agenda for talks with German leaders—as "nonsense." But Lichnowsky did not speak only for himself; his opinion accurately reflected the German government's opposition to any discussions about reducing the naval competition.

Churchill, while wanting to begin a constructive negotiation with Germany's leaders, harbored few illusions about the reception that he was likely to receive when he presented to them once again the holiday proposal. "I do not expect," he admitted, "any agreement on these [holiday proposals], but I would like to strip the subject of the misrepresentation and misunderstanding with which it has been surrounded, and put it on a clear basis in case circumstances should ever render it admissible." Even if Churchill could not move Germany's leaders to agreement, he could still use a German refusal to negotiate to his benefit in beating back the opposition at home to the Admiralty's spending requests. The deep disagreement among Liberals about naval spending made it imperative that Churchill undertake some arms-control initiative to underscore Berlin's intransigence against seeking a settlement. "I hope," Churchill wrote Grey and Prime Minister H. H. Asquith, "in view of the very strong feeling there is about naval expenditure and the great difficulties I have to face, my wish to put these points to Admiral Tirpitz . . . may not be dismissed."[60] If Churchill could not induce Germany's rulers to cut back on warship construction, he could at least placate the radical Liberals who wanted to curtail British naval spending.

Getting an invitation from Germany's leaders to visit Kiel, however, proved easier for Churchill than obtaining support from his colleagues in government, as his initiative ran into firm opposition from Grey. Although Grey had been informed of the back-channel attempt by Ballin and Cassel to open talks and approved of the visit of the British battleship squadron to Kiel, the foreign secretary was taken aback when Goschen's telegram arrived with the invitation from the kaiser (through Prince Henry) for Churchill to go to Germany. "This will never do at the present moment," Grey noted on Goschen's telegram, "and there was so I understood no question of the First Lord and the First Sea Lord going with the fleet."[61] Only two weeks before, Grey had received a note from Churchill saying

that a visit by him to Germany during the Kiel festivities was "impracticable."[62] Grey quickly moved to put the brakes on negotiations led by Churchill. Instead of a summit at Kiel, Grey suggested that the two sides explore ways to reduce the naval rivalry by opening talks at a much lower level, involving the naval attachés in London and Berlin. If these negotiations showed promise, then, Grey thought, follow-up higher-level meetings could take place. Previous arms-control overtures to Berlin had failed, and Grey saw nothing to indicate that Churchill's visit would produce any different outcome. Quite the contrary, the brief flurry of discussions with Jagow and Tirpitz only three months before indicated that the German government lacked any interest in serious talks.

Grey saw Churchill's initiative too as a challenge to his own control over the conduct of Britain's foreign policy. Grey resented what he perceived as Churchill's interference in the purview of his department. Despite several challenges to his authority, Grey had shown himself a shrewd bureaucratic turf fighter, holding on to the reins of power for over eight years. Churchill's attempt to engineer negotiations had the appearance of similar, previous efforts to get around Grey and the Foreign Office.[63] In his reply to Churchill's request to negotiate with German leaders, a glimmer of testiness about trespass on the departmental responsibilities of colleagues appears: "I put this [alternative approach, i.e., talks between naval attachés] forward with diffidence as it is out of my sphere." Asquith backed Grey in rejecting a visit by Churchill to Germany.[64] Goschen was duly instructed to inform the German government that notwithstanding the back-channel arrangements, Churchill would not accompany the British battleship squadron to Kiel. Goschen reported back the kaiser's reaction: "His Majesty quite understood the situation and expressed his regret that they [that is, Churchill and Battenberg] could not come in the most friendly manner."[65]

Despite Grey's objections and Asquith's veto, Churchill persisted in his effort to meet with Germany's leaders. Even though Goschen diplomatically gave word that Churchill could not accept the kaiser's invitation, the German government still remained unsure whether a visit might occur. According to Ballin, "Churchill sent word that, if Tirpitz really wanted to see him, he would find [a] means to bring about such a meeting." A last-minute visit by Churchill thus remained a distinct possibility, with the Germans even reserving a mooring spot for *Enchantress* in case the first lord crossed over the North Sea.[66] Since the kaiser and Tirpitz wanted to avoid negotiations, they made no further effort to entice Churchill into visiting Kiel.

IV

German intransigence doomed Churchill's holiday plan, preventing it from becoming the basis for serious negotiations between Britain and Germany.

Churchill sought to engage Germany's rulers in an attempt to rescue them from the strategic trap that they had made for themselves. He wanted to address head-on the naval rivalry that drove the antagonism between the two countries. But Berlin refused to consider restrictions on the buildup of German naval power. By threatening Britain's long-standing position as the world's leading sea power, German decision makers thought that they were providing for their country's security, as well as enhancing its rank and reputation on the international stage. The devotion of the kaiser and Tirpitz to the buildup of a powerful navy caused great harm, antagonizing even British Liberals and bringing Britain into the lists of the countries that sought to contain the rise of German power. Churchill would later write, "With every rivet that von Tirpitz drove into his ships of war, he united British opinion throughout wide circles of the most powerful people in every walk of life and in every part of the Empire. The hammers that clanged at Kiel and Wilhelmshaven were forging the coalition of nations by which Germany was to be resisted and finally overthrown."[67] Germany's rulers would have better served their own interests, along with the well-being of the German people, had they worked with Churchill rather than trying to thwart him.

The opportunity for Britain and Germany to reach an agreement would suddenly close during the summer of 1914 with the outbreak of war. Churchill's proposal to visit Kiel, as it turned out, represented a last chance for high-level, face-to-face talks between British and German leaders. Instead, Britain and Germany would settle their rivalry by fighting. To Churchill's great credit, he had sought to prevent a clash with Germany, to find a negotiated settlement to the naval competition and ways of making both countries more secure. At the same time, in preparing the Royal Navy for the coming trial of strength, Churchill made a vital contribution to the ultimate victory of British arms in the Great War.

NOTES

1. Minute by Grey on Cartwright to Grey, 24 February 1911, Foreign Office Papers 371/1123, ff. 51–53A, The National Archives, Kew, United Kingdom [hereafter TNA].
2. A. J. P. Taylor, *The Struggle for Mastery in Europe, 1848–1918* (Oxford, U.K.: Oxford Univ. Press, 1971), pp. 501–502; Lichnowsky to Bethmann Hollweg, 30 April 1913, in *Die grosse Politik der europäischen Kabinette, 1871–1914,* ed. Johannes Lepsius, Albrecht Mendelssohn Bartholdy, and Friedrich Thimme (Berlin: Deutsche Verlagsgesellschaft für Politik und Geschichte, 1927) [hereafter *G.P.*], vol. 39, no. 15,572, pp. 38–39.
3. Churchill to Grey, 24 October 1913, in *British Documents on the Origins of the War, 1898–1914,* ed. G. P. Gooch and Harold Temperley (London: His Majesty's Stationery Office, 1930) [hereafter *B.D.*], vol. 10, part 2, no. 487, p. 721.
4. Winston S. Churchill, *The World Crisis, 1911–1914* (London: Thorton Butterworth, 1923), pp. 72, 148.
5. Churchill to William Royle, 20 December 1911, in Randolph S. Churchill, *Winston S. Churchill,* vol. 2, companion part 2, *1907–1911* (London: Heinemann, 1969) [hereafter *Companion*], pp. 1360–61.

6. "Government Policy and the Foreign Situation," 14 August 1908, in *Winston S. Churchill: His Complete Speeches, 1897–1963,* vol. 2, *1908–1913,* ed. Robert Rhodes James (London: Chelsea House, 1974) [hereafter *Speeches*], pp. 1082–87.
7. "Free Trade," 4 August 1908, in ibid., pp. 1081–82.
8. Bernard Brodie, *War and Politics* (New York: Macmillan, 1973), p. 319.
9. Figures culled from Viscount Hythe and John Leyland, eds., *The Naval Annual, 1914* (London: William Clowes, 1914), pp. 76, 83.
10. Churchill, *World Crisis,* pp. 20–21.
11. Churchill to Grey, 9 September 1909, enclosing a note about a conversation with the German ambassador, in *Companion,* vol. 2, part 2, pp. 958–61.
12. Churchill to Fisher, 19 February 1912, in Churchill, *World Crisis,* pp. 107–108.
13. Churchill to J. L. Garvin, 10 August 1912, in Garvin Papers, Harry Ransom Humanities Center, University of Texas at Austin.
14. Churchill, *World Crisis,* pp. 107–108.
15. *Parliamentary Debates,* Commons, 5th ser., vol. 34, cols. 1340–41, and vol. 35, col. 35.
16. Churchill, *World Crisis,* p. 112.
17. Arthur J. Marder, *From the Dreadnought to Scapa Flow* (London: Oxford Univ. Press, 1961), vol. 1, p. 285.
18. Churchill to Grey, 24 October 1913, *B.D.,* vol. 10, part 2, no. 487, p. 721.
19. Churchill, "Memorandum on Naval Estimates 1913–14," 24 December 1912, p. 6, Admiralty Papers 116/1294B, TNA.
20. *Parliamentary Debates,* Commons, 5th ser., vol. 50, cols. 1749–91.
21. See Grey to Goschen, 5 March 1913, *B.D.,* vol. 10, part 2, no. 465, pp. 687–88.
22. *G.P.,* vol. 39, p. 48 note.
23. Goschen to Grey, 3 July 1913, *B.D.,* vol. 10, part 2, no. 480, pp. 705–706. Grey sided with Churchill, and his support cleared the way for a renewed offer for a naval holiday; see Minute by Mr. Winston Churchill, 8 July 1913, ibid., no. 481, pp. 706–707. For Grey's support, see Grey to Goschen, 28 October 1913, ibid., no. 488, p. 722.
24. Alfred von Tirpitz, *Der Aufbau der deutschen Weltmacht* (Stuttgart, Ger.: J. G. Cotta'sche, 1924), vol. 1, p. 396.
25. *G.P.,* vol. 39, pp. 39–46.
26. *Speeches,* pp. 2173–76; "Mr. Churchill in Manchester," *Times,* 20 October 1913, pp. 9–10.
27. Goschen to Grey, 22 October 1913, *B.D.,* vol. 10, part 2, no. 485, p. 719.
28. See *B.D.,* vol. 10, part 2, no. 502, enclosure 2, p. 739.
29. Grey to Goschen, 8 August 1912, *B.D.,* vol. 10, part 2, no. 451, pp. 655–57.
30. Prince Lichnowsky, *My Mission to London, 1912–1914* (New York: George H. Doran, [1918]), pp. 22–23 [emphasis original].
31. Goschen to Grey, 8 November 1913, *B.D.,* vol. 10, part 2, no. 489, p. 723.
32. Tirpitz, *Aufbau der deutschen Weltmacht,* vol. 1, p. 422.
33. Grand-Admiral [Alfred] von Tirpitz, *My Memoirs* (London: Hurst and Blackett, 1919), vol. 1, p. 208.
34. Report of Captain Müller, 30 March 1914, *G.P.,* vol. 39, pp. 86–99.
35. Tirpitz, *Aufbau der deutschen Weltmacht,* vol. 1, p. 395.
36. V. R. Berghahn, *Germany and the Approach of War in 1914* (New York: St. Martin's, 1973), p. 129.
37. House Diary, 23 May 1914, Sterling Memorial Library, Yale University, New Haven, Conn.
38. Henry Kissinger, *Diplomacy* (New York: Simon & Schuster, 1994), p. 188.
39. *Times,* 28 March 1913, pp. 11–12.
40. *National Review* 62, no. 369 (November 1913), p. 368.
41. *Times,* 21 October 1913, p. 8.
42. Minute by Crowe on Goschen to Grey, 10 February 1914, *B.D.,* vol. 10, part 2, no. 501, p. 737.
43. Goschen to Nicolson, 24 October 1913, *B.D.,* vol. 10, part 2, no. 486, p. 720.
44. Goschen to Grey, 3 July 1913.
45. Esher to Stamfordham, 26 October 1913, in *Journals and Letters of Reginald Viscount Esher, 1860–1915,* ed. Oliver Esher and M. V. Brett (London: Nicholson and Watson, 1938), vol. 3, p. 142.
46. H. H. Asquith, *The Genesis of the War* (London: Cassell, 1923), pp. 107, 144.

47. F. W. Wiemann, "Lloyd George and the Struggle for the Navy Estimates of 1914," in *Lloyd George: Twelve Essays,* ed. A. J. P. Taylor (New York: Atheneum, 1971), pp. 71–91.

48. Bernhard Huldermann, *Albert Ballin* (London: Cassell, 1922), p. 192.

49. Churchill to Grey, 8 May 1914, in *Companion,* vol. 2, part 3, p. 1977.

50. Watson to Goschen, "Remarks of His Majesty the Emperor to Naval Attaché," 12 May 1913, *B.D.,* vol. 10, part 2, no. 475, p. 701 [emphasis original]. Despite the kaiser's assertion to the contrary, Churchill received an invitation to the German army's maneuvers in 1909; see Churchill to his mother, Lady Randolph Churchill, 4 August 1909, in *Companion,* vol. 2, part 2, p. 903.

51. Treutler to German Foreign Office, 27 April 1914, *G.P.,* vol. 39, p. 100.

52. Goschen to Grey, 18 May 1914, *B.D.,* vol. 10, part 2, no. 509, pp. 744–45.

53. Captain Henderson to Churchill, 16 May 1914, CHAR 13/45, Churchill College Archives, Cambridge, U.K.

54. Churchill to Asquith and Grey, 20 May 1914, in *Companion,* vol. 2, part 3, pp. 1978–80.

55. On German armaments policy, see David Stevenson, *Armaments and the Coming of War: Europe, 1904–1914* (Oxford, U.K.: Clarendon, 1996), pp. 339–40.

56. Wilhelm to Bethmann Hollweg, 9 February 1914, in *German Diplomatic Documents,* trans. E. T. S. Dugdale, vol. 4, *The Descent to the Abyss, 1911–1914* (London: Methuen, 1931), p. 320.

57. Goschen diary entry, 26 March 1914, in *The Diary of Edward Goschen, 1900–1914,* ed. Christopher H. D. Howard (London: Royal Historical Society, 1980), p. 268.

58. Lichnowsky to Jagow, 10 May 1914, in Prince Lichnowsky, *Heading for the Abyss: Reminiscences* (London: Constable, 1928), pp. 346–48.

59. Lichnowsky to Jagow, 26 May 1914, in ibid., pp. 346–47.

60. Churchill to Asquith and Grey, 20 May 1914.

61. Minute by Grey on Goschen to Grey, 18 May 1914, *B.D.,* vol. 10, part 2, no. 509, p. 745.

62. Churchill to Grey, 8 May 1914.

63. Lloyd George, for example, when he visited Germany during the summer of 1908, had sought high-level negotiations with German decision makers. Grey, in response, complained to Asquith about this interference in the running of British foreign policy. The interview given by Lloyd George and published on New Year's Day 1914 had also elicited a response by Grey. Since Lloyd George supported Churchill's visit to Kiel, Grey might have viewed this initiative as yet another challenge to his authority.

64. Memorandum by Grey, 25 May 1914, *B.D.,* vol. 10, part 2, no. 512, pp. 748–49.

65. Since no formal invitation was sent by the German government—only the statement of Prince Henry to Goschen—there was some confusion over whether Churchill had actually been invited to visit Germany and about how to respond. The German embassy in Britain, for example, was unclear about the visit, apparently not knowing of Prince Henry's invitation. Lichnowsky told Churchill's mother at a dinner party that while the German government "had not invited him [that is, Churchill], . . . should he decide to come, he might be sure of a cordial reception"; Lichnowsky to Jagow, 26 May 1914. Goschen, consequently, tactfully used the occasion of a state luncheon to talk directly to the kaiser about the matter. First, however, Goschen ascertained that the kaiser had indeed instructed Prince Henry to offer a verbal invitation. The British ambassador then informed the kaiser—no doubt to his great relief—that Churchill would be unable to visit Kiel; Goschen to Grey, 3 June 1914, *B.D.,* vol. 10, part 2, no. 515, p. 750.

66. Huldermann, *Albert Ballin,* p. 192; Churchill requested information about how quickly *Enchantress* could reach Kiel; see J. D. Allen, handwritten letter, 7 May 1914, CHAR 13/45, Churchill College Archives, Cambridge, U.K.

67. Churchill, *World Crisis,* p. 115.

THE HISTORY OF THE TWENTY-FIRST-CENTURY CHINESE NAVY

Bernard D. Cole

China historically has been a continental rather than a maritime power, despite its more than eleven thousand miles of coastline and more than six thousand islands. It has more often viewed the sea as a potential invasion route for foreign aggressors rather than as a medium for achieving national goals, a tendency that has contributed to the weakness of the Chinese maritime tradition. This attitude had changed by the beginning of the twenty-first century. The remarkable growth of China's economy beginning in the last two decades of the twentieth century, the broadening of Beijing's global political and economic interests, and resolution of almost all border disputes with its many contiguous neighbors have contributed to increased attention to threats to the vital sea lines of communication (SLOCs) on which China increasingly depends.

The historical missions of China's navy—called the People's Liberation Army Navy (PLAN)—were described in 1982 as "resist invasions and defend the homeland," attesting to the service's role as a coastal-defense force in support of the ground forces facing a potential Soviet invasion of China. Deng Xiaoping, however, delineated an "offshore defense" strategy in 1985, while in 1993 the PLAN was directed to "safeguard the sovereignty of China's national territorial land, air, and seas" and

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to "uphold China's unity and security." This new strategy and direction marked the PLAN's transition to the post–Cold War world.

The four historical missions listed by President Hu Jintao in 2004 were the traditional responsibility of ensuring the military's loyalty to the Chinese Communist Party (CCP); ensuring sovereignty, territorial integrity, and domestic security, to include preventing Taiwanese separatism; and the new responsibilities of safeguarding expanding national interests, including maritime security and "nontraditional security problems," and helping to ensure world peace. The PLAN was being described as "a strategic service" by 2008.[1]

The navy's commander, Admiral Wu Shengli, addressed his service's missions and intentions at its sixtieth-anniversary review, in 2009. He called for strengthened logistics and support facilities "to improve far-sea repair, delivery, rescue and replenishment capacities" while establishing "a maritime defense system . . . to protect China's maritime security and economic development." These remarks reinforced Wu's 2007 call for creation of a "powerful armed force on the sea" as a "long cherished dream for the Chinese nation."[2]

IMPERIAL CHINA

Despite China's historical dependence on ground forces to guard its national security interests, the PLAN can trace its lineage back through the dynasties. The earliest recorded naval battle in China occurred in 549 BC, during the Spring and Autumn Period, when rival rulers used ships to attack each other.[3] Large-scale naval operations continued to play a role in Chinese warfare through the Han dynasty (206 BC–AD 220). Chinese sea-goers were the first to control their ships with sails and rudders, employ compartmentation, paint vessels' bottoms to inhibit wood rot, and build dry docks. They developed the art of navigation to a high degree, including use of the portable compass as early as 1044.[4] China had established regular commercial sea routes to southwestern Asia and western Africa by the end of the Tang dynasty (AD 907).[5]

The Song Dynasty

The high point of naval developments in imperial China probably occurred during the Song dynasty (AD 960–1279), as part of a five-hundred-year period when China deployed "the world's most powerful and technologically sophisticated navy."[6] During this time, the military organized in times of emergency fleets composed of several hundred warships and supply vessels. One Song fleet in AD 1274 reportedly totaled 13,500 ships.[7] Chinese maritime technology also matured during this age; shipping was an important part of the national economy.

Perhaps most significantly, the Song regime was the first in China to establish a permanent national navy, functioning as an independent service administered

by a central government agency. The Imperial Commissioner's Office for the Control and Organization of the Coastal Areas was established in 1132 to supervise a navy of fifty-two thousand men.[8]

The Song experience was based on a rapidly expanding national economy, with a particularly strong maritime sector encompassing commerce, fisheries, and transportation. As the navy expanded, so did port facilities, supply centers, and dockyards; soldiers were trained specifically as marines, and coast-guard squadrons were established. Song navies used both sail and paddle-wheel-driven craft, the latter powered by laborers on treadmills. Doctrine was formalized, and it included the development of formation maneuvers, long-range projectile launchers, and complex tactics.[9]

China remained a sea power during the two succeeding dynasties. In fact, the overthrow of the Song regime by the Yuan (Mongol) dynasty resulted in significant part from the latter's conduct of naval warfare. The Yuan later used large fleets to undertake invasions of Vietnam, Java, and Japan. The 1274 expedition against Japan, which proved unsuccessful, involved nine hundred ships and 250,000 soldiers; that of 1281 included 4,400 ships.[10] Maritime commerce continued to expand, and cannon made their appearance on board ship.[11]

The Ming Dynasty

During the Ming dynasty (1368–1644) China saw both the pinnacle of its overseas naval deployments and the collapse of its naval power. The crux of the successful Ming struggle to succeed the Yuan was a series of battles on the lakes of the Yangtze River valley. The waterborne forces employed by the Ming and their opponents were not independent navies but rather army units assigned to ships on the local lakes and rivers. Their original mission was to transport men and supplies, but the armies quickly recognized the advantages of using these craft as warships, against both land forces and each other. The Ming ships were manned by about twelve thousand troops and were armed with archers, cannon, and "flame weapons." The "lake campaign" was an effective use of ships and men to take advantage of battlefield topography but did not result in the establishment of a regular Ming navy.

The early-fifteenth-century voyages of Zheng He to the Middle East and Africa also occurred during the Ming dynasty. They demonstrated a standard of Chinese shipbuilding, voyage management, and navigation well beyond European capabilities. Zheng He led large fleets of ships, some displacing over four hundred tons, on seven voyages halfway around the world at a time when Portuguese explorers were still feeling their way down the west coast of Africa in fifty-ton caravels.

After just thirty years, the Ming rulers deliberately ended these voyages for domestic financial, political, and ideological reasons, just at the time when European nations were beginning to use the high seas to achieve economic wealth and to proselytize. Why were these expeditions ended? First, the voyages were expensive, and the Ming pursued a rigid economic policy. Second, the ruling circle was concerned about the growing power of the court eunuchs, who were the voyages' chief sponsors. Third, "Confucian-trained scholar-officials opposed trade and foreign contact on principle."[12]

Perhaps most importantly, however, the threat from Mongols and other Asian aggressors was growing stronger, which both increasingly focused government concerns inland and absorbed a growing portion of the national budget. By 1500, "anti-commercialism and xenophobia [had] won out," and the government thereafter attempted to deal with maritime problems by ignoring them. The navy was allowed to deteriorate; by the end of the sixteenth century the Ming government was unable even to defend its maritime traders against pirates.

During its long period of brilliant maritime scientific progress and dominating power, however, China's national security concerns had focused not at sea but on the north and west—with good reason, since that was where the threat to the regime lay. No dynasty fell as a direct result of maritime invasion or pressure: usurpers emerged from the Asian interior, and the crucial battles were land fights. The navy was at various times capable and even powerful, but never was it vital to a dynasty's survival, even in the face of the centuries-long threat from Japanese "pirates," as the Chinese habitually called their neighbors.

The Qing Dynasty

Typical of the process of dynastic progression, the Qing (Manchu) dynasty replaced the Ming in 1644 after a long period of land warfare in which naval power played a very small role. The Qing made no concerted effort to rebuild the navy or expand the maritime sector of China's economy following their assumption of power. The Qing regime faced no significant threat from the sea during its first century and a half in power, and there seemed little justification for investing in a modern navy. This was especially true after the most notable Qing maritime campaign, when after several failed attempts it conquered Taiwan in 1683.

Overseas trade grew despite Qing indifference, owing in part to the extensive settlement of "overseas Chinese" throughout Southeast and South Asia that had begun during earlier dynasties. The Qing navy remained powerful enough to prevent coastal piracy from getting out of hand, to maintain order on the canals and rivers, and to perform other coast-guard functions. China had fallen so far behind the global norm in naval power, however, that it was unable to defeat the late-eighteenth- and early-nineteenth-century imperialists—who came by sea.

Failed Modernization

As the Qing reeled from the imperialist onslaught and from the effects of the Taiping Rebellion, which ended in 1864, major "restoration" movements occurred in China. These "self-strengthening" efforts, under the slogan "Chinese learning as the fundamental structure, Western learning for practical use," included building and training a modern navy. This facet of modernization probably resulted from admiration of the technology represented by a modern warship and from the fact that the imperialist powers had used their navies to impose humiliating defeats on China.

An arsenal was established in Shanghai to build steam-powered gunboats, but efforts to modernize China's navy too often fell victim to Confucian traditionalists, who were the rigid ideologues of the day; it was in part a case of ideology defeating professionalism, a problem that has persisted. Nonetheless, by 1884 China had deployed a modern navy, led by the efforts of Li Hongzhang, one of the most prominent of the scholar-bureaucrats who appreciated how far behind the foreign powers China had lagged. Li used three approaches to build the new navy, which he thought should be oriented toward coastal defense: indigenous production, purchases abroad, and the reverse engineering of foreign systems.

Unfortunately, the new navy suffered from high-level governmental corruption and weak administration.[13] It was organized into four fleets that were essentially independent navies. The Beiyang Fleet, organized by Li Hongzhang, was the most modern and powerful; by 1884 it included two 7,500-ton-displacement, German-built battleships. The Fujian Fleet was homeported in Fuzhou; the other two fleets were the Nanyang and Guangdong.

This new navy was well regarded by Western observers but soon became embroiled in battle with two foreign fleets, one of them Western. Disputes with France over its colonization of Vietnam led to the outbreak of hostilities in August 1884; Chinese ground forces did well, but the local French fleet attacked the Chinese Fujian Fleet in Fuzhou Harbor and sank every ship.[14] China's other fleets were not sent to fight the French; Li wanted to conserve and build up remaining naval strength. His efforts were successful on paper, including establishment of a national Navy Office, a better-organized training regimen and shore establishment, and in 1888 standardized naval regulations.[15]

Despite these achievements, China's navy failed to become a coherent national force; its most powerful fleet came to grief attempting to halt Japanese incursions into Korea in the 1890s. The Beiyang Fleet—of two battleships, ten cruisers, and two torpedo boats—lost a sea battle to the Japanese in September 1894 and withdrew to Weihaiwei, a strongly fortified harbor on the northern Shandong coast. In January 1895 the Japanese landed troops who seized the Chinese batteries

guarding the harbor and turned their guns on the Chinese ships.[16] The Beiyang Fleet was eviscerated by its losses in ships, in conjunction with the suicides of the fleet commander and other senior officers.[17] Again, the other Chinese fleets failed to join the fight.

These naval conflicts with the French and the Japanese demonstrated that while Beijing had acquired the ships and weapons of a modern navy, it had failed to institute effective central administration, training, logistical and maintenance support, or command and control. Furthermore, operational doctrine was almost completely lacking; the navy's leaders failed to establish interfleet coordination, exercises, or mutual support. Finally, China had failed to provide its new navy with a coherent strategy tied to national security objectives. China's attempt to deploy a modern navy in the late nineteenth century failed miserably as a result of these factors.

THE REPUBLIC OF CHINA (1911–1949)

During the Republican period, Chinese naval forces under Chiang Kai-shek's Nationalists and the Kuomintang Party (KMT) relied almost entirely on ships leftover from the Qing or obtained from foreign nations. No significant efforts were made to rebuild the navy, given China's general political and economic disarray. Individual warlords occasionally made effective use of maritime units, but their ships were employed to augment ground forces, which was how navies had traditionally been employed by Chinese leaders. The low point was probably reached during the height of the warlord period, in the middle to late 1920s, when a Western observer dismissed the Chinese navy as a serious force:

> There has been a steady deterioration in the discipline of the Chinese Navy since the establishment of the Republic, and it has now ceased to exist as a national force, the different units being under the control of various militarists, who treat the vessels as their own private property. . . . It is impossible today to obtain a complete list of Chinese warships, showing to which party or militarist faction they belong. Vessels have been changing their allegiance . . . with bewildering frequency.[18]

The government did not develop a maritime strategy, since the primary threats to the new regime were on the ground, from the CCP and warlords. Naval actions that did occur took place chiefly on the rivers, especially the Yangtze and the waterways of the Canton delta. Many of the warlords who struggled to gain control of various provinces and districts during the 1916–28 revolutionary period used China's inland waterways for transportation, as military barriers, or as sources of revenue—taxing the dense river and canal traffic. These efforts led to frequent firefights between provincial forces and the imperialist gunboats that patrolled China's rivers and lakes, but most of these episodes were of no significance insofar as coherent maritime thinking or navy building by China was concerned.

There were two notable exceptions. First was a battle at the upper Yangtze River port city of Wanhsien in September 1926. The local warlord, General Yang Sen, had commandeered British-owned steamers to transport his troops; when a British gunboat, HMS *Cockchafer,* attempted to free the steamers it ran into an ambush, very capably managed by Yang, and suffered severe casualties.[19] There was also an October 1929 naval and land engagement on the Heilong (Amur) River between Chinese and Soviet forces, one that foreshadowed the 1969 incident over disputed boundaries.[20]

Sea power was an effective "force multiplier" for the foreign powers present in China, who used sea and river transport to move troops rapidly from crisis area to crisis area.[21] Great Britain, the United States, and Japan were thus able to influence the course of events in revolutionary China with relatively small military forces. Republican China was unable to contest their maritime strength.

China's record as a naval power during the long period of empire and republic shows an understandable focus on the continental rather than maritime arena. Navies were built and employed almost entirely for defensive purposes. Maritime strength was regarded as a secondary element of national power.

THE PEOPLE'S REPUBLIC OF CHINA

The communist victory in 1949 was an army victory; the People's Liberation Army (PLA) was unable to project power across even the narrow Taiwan Strait. The KMT navy continued raiding coastal installations, landing agents, attacking merchant craft and fishing vessels, and threatening to invade the mainland. The government in Beijing of the new People's Republic of China (PRC) sought to defend its coastline and island territories against both the United States and the KMT regime on Taiwan. Coastal defense was emphasized in January 1950 with the creation of a new East China Military Command, headquartered in Shanghai and deploying more than 450,000 personnel. The East China Navy was formed as part of this force.

The Early Years: 1949–1954

Beijing ordered these troops to defend China's coast against "imperialist aggression from the sea," continue the fight against Chiang's forces, and help with economic reconstruction.[22] This first PRC navy was constituted largely by the defection of the KMT Second Coastal Defense Fleet.[23] The new navy's commander said it was needed "to safeguard China's independence, territorial integrity and sovereignty against imperialist aggression[,] . . . to destroy the sea blockade of liberated China, to support the land and air forces of the People's Liberation Army in defense of Chinese soil and to wipe out all remnants of the reactionary forces."[24] A navy was also required to establish law and order on coastal and riverine waters, help the army capture offshore islands still occupied by the KMT,

and prepare for the capture of Taiwan. The CCP Politburo further charged the new navy with "defending both [eastern and southeastern] China coasts and the Yangtze River."[25] General Zhang Aiping was the first commander (and political commissar) of the navy. Among his first acts were the establishment of a naval staff college at Nanjing and organization of a rudimentary maintenance and logistical infrastructure.

The PLAN was officially established in May 1950, under the command of General Xiao Jinguang. The Chinese wanted a defensive force that would be inexpensive to build and could be quickly manned and trained.[26] Zhang and Xiao were typical of the early PLAN leadership—revolutionary officers who had spent their entire careers as ground commanders and had been transferred to the navy for reasons of political reliability and proven combat record rather than for any particular naval experience.

Soviet Assistance. Mao Zedong, as chairman of the CCP's Central Committee, obtained financial assistance during a 1949–50 visit to Moscow; he planned to use half the initial Soviet loan of $300 million to purchase naval equipment. The new PLAN also ordered two new cruisers from Great Britain and attempted to obtain surplus foreign warships through Hong Kong, efforts that were nullified by the outbreak of the Korean War.[27]

China acquired mostly small vessels suitable to combat the coastal threat from Taiwan, initially obtaining four old Soviet submarines, two destroyers, and a large number of patrol boats. The new force also included about ten corvettes, forty ex-U.S. landing craft, and several dozen miscellaneous river gunboats, minesweepers, and yard craft, all seized from the KMT. The Soviets also helped establish a large shore-based infrastructure, including shipyards, naval colleges, and extensive coastal fortifications.[28]

Offshore Islands. Beijing's goal was seizure of the offshore islands still occupied by the KMT; the invasion of Taiwan was scheduled initially for the spring of 1950 but was soon postponed to the summer of 1951. Mao Zedong considered the capture of Taiwan "an inseparable part of his great cause of unifying China."[29] He lacked experience in naval warfare but quickly learned that a successful campaign against Taiwan would require adequate amphibious training, naval transportation, "guaranteed air coverage," and the cooperation of a "fifth column" on the island—requirements that still apply.[30]

China achieved a major victory when in April 1950 the PLA occupied Hainan, after Taiwan the largest island held by the Nationalists. The campaign cost Beijing heavily in personnel losses but captured more than ninety thousand Nationalist troops. This victory resulted from the PLA's careful planning, its ability to neutralize superior Nationalist naval and air forces by use of shore-based artillery to gain

effective control of the sea and airspace between Hainan and the mainland, and the characteristically poor performance of Taiwan's senior commanders.

The Korean War began two months later, and China's fear of American aggression was heightened when in June 1950 President Harry Truman ordered the U.S. Seventh Fleet into the Taiwan Strait. This meant America's reentry into the Chinese civil war. Truman claimed that it was intended to prevent either side from attacking the other; however, Beijing understood that the president was committing the United States to the defense of Taiwan—after having refused to do so for many months.[31] Premier Zhou Enlai called Truman's move "violent, predatory action by the U.S. Government [that] constituted armed aggression against the territory of China and total violation of the UN charter."[32] Beijing also understood, as it does today, that the United States possessed complete air and sea superiority in the western Pacific Ocean.

Beijing's concern was reinforced in February 1953, when President Dwight Eisenhower withdrew the U.S. fleet from the Taiwan Strait, thus in theory "unleashing" Nationalist forces on Taiwan to attack China.[33] In December 1953, Mao Zedong assigned the PLAN three priority missions: to eliminate KMT naval interference and ensure safe navigation for China's maritime commerce, prepare to recover Taiwan, and oppose aggression from the sea.[34]

The PRC's young navy faced many problems, including a lack of trained personnel and of amphibious ships, as demonstrated in the very spotty record of assaults on KMT-held coastal islands. Furthermore, in February 1952 Mao diverted the navy's ship-acquisition funds to the purchase of aircraft needed for combat over Korea.[35] Acquisition of equipment from foreign sources also was constrained by Western refusal to sell arms to the PRC and by domestic budgetary limitations.

Furthermore, despite several visits to Moscow by senior PLA leaders, the Soviets continued to insist on immediate payment for their ships, although most of them were obsolete.[36] The PLAN also lacked airpower and was just beginning to establish a capable maintenance and logistical infrastructure.

1955–1959

The Korean War provided China with mixed naval lessons. The amphibious landing at Inchon in September 1950 was a major turning point of the war, while United Nations command of the sea allowed free employment of aircraft carriers and battleships to bombard North Korean and Chinese armies. The UN forces suffered at least one significant maritime defeat, however, when a planned amphibious assault on the east-coast port of Hungnam in October 1950 had to be canceled because the harbor had been mined. Overall, however, Korea was not a maritime conflict, and the PLA ground forces' dominant role there contributed to a continued policy of limiting the navy to coastal defense.

PLAN operations in the mid-1950s continued to focus on KMT attacks against the mainland and on capturing islands still held by Taiwan. The 1954–55 Taiwan Strait crisis included the PLA's capture of the Dachen Islands, an effort that took advantage of superior airpower and a well-coordinated amphibious assault against an outlying island.[37]

The navy's First Aviation School was founded at Qingdao in October 1950, and the navy's air force, referred to as "the People's Liberation Army Navy Air Force," or simply "naval aviation," was formally established in 1952. Its mission was support of antisurface and antisubmarine defensive operations. Its initial inventory was eighty aircraft, including MiG-15 jet fighters, Il-28 jet bombers, and propeller-driven Tu-2 strike aircraft. Naval aviation had grown to about 470 aircraft by 1958.[38]

PLAN operating forces were organized into the North Sea, East Sea, and South Sea Fleets. The decade ended with the PRC in possession of all the disputed islands except Quemoy (Kinmen), Matsu (Mazu), the Pescadores (Penghus), and of course Taiwan. The PLA also had defeated KMT raids on the mainland, as well as attacks on merchant and fishing vessels.[39] The PLAN had been organized, sent to sea, and proven effective as a coastal-defense force within ten years of its founding.

A New Situation: 1960–1976

The 1960s were marked by major foreign and domestic events that further constrained development of a seagoing navy. Most important was the split with the Soviet Union, dramatically manifested in mid-1960 when Soviet advisers (and their plans) were withdrawn from China. The navy suffered, with the rest of the PLA, as military development projects were left in turmoil.

Other significant events in the early 1960s included war with India, the reemerging Vietnam conflict, turmoil in the new African states, and revolutionary movements throughout Southeast Asia. None of these major international events directly involved the PLAN; they did not provide justification for naval modernization, which was accordingly extremely limited. By the end of the 1960s, however, relations with the Soviet Union had deteriorated to the point of armed conflict along the Amur River. The former ally was now the enemy; soon the United States would be China's ally. Beijing viewed the Soviet navy as a major amphibious invasion threat. That navy deployed only weak amphibious forces in its Pacific Fleet, but China was worried by a history of military threats from the north, by Soviet proximity, and by the concentration of economic developments in its own northeast.[40]

Significant naval developments were hampered also by the forced industrialization and collectivization program of 1958–61 known as the "Great Leap

Forward," and even more by the Great Proletarian Cultural Revolution, lasting from approximately 1966 to 1976. The PLAN continued to serve as an extension of the army; modernization was limited, since prevailing PLA doctrine, that of "People's War," portrayed technology and weaponry as insignificant compared to the revolutionary fervor of soldiers imbued with Mao's ideology. The Cultural Revolution seriously hampered technological development in general; even the relatively sacrosanct missile, submarine, and nuclear weapons programs were affected.[41] PLAN modernization was retarded by perhaps two decades as a result of program restrictions and personnel losses that occurred during this political maelstrom. Except for the evolution of maritime nuclear power, the PLAN missed or was very late joining developments that were common elsewhere in most warfare areas, including the employment of guided missiles in antiair, antisurface, and antisubmarine warfare; automation and computerization of command and control; expanded use of shipborne helicopters; automation of gunnery and sensor systems; and even the advent of automation and gas turbine technology in ship propulsion.

PLAN modernization was hamstrung in the last years of the Cultural Revolution by the "Gang of Four." Mao's widow, Jiang Qing, led an attack on naval missile development. Another member of the clique, Zhang Chunqiao, expressed its anti-navy, "continentalist" view.[42] By 1970, however, despite this attitude and a lack of resources for major conventional force development, the PLAN had moved into the missile age, deploying a Soviet-designed ballistic-missile submarine and ten Soviet-built patrol boats armed with cruise missiles.

Despite the ideological turmoil of the late 1950s and the 1960s, Beijing was in these years investing heavily in developing nuclear-armed missiles and nuclear-powered submarines to launch them. Beijing had relied on Soviet nuclear forces to counter the American nuclear threat during the 1950s. Among the reasons stresses in the alliance with Moscow had become more divisive as the 1960s progressed was that Mao Zedong was determined that China develop its own nuclear forces, proclaiming that "even if it takes 10,000 years, we must make a nuclear submarine."[43] Mao was adamant that China should join the nuclear club. These were national rather than PLAN projects, however, and did not significantly increase the navy's ability to obtain the military resources necessary for modernization.

The budgetary emphasis on nuclear weapons, the economic disruptions resulting from the disastrous Great Leap Forward and the Cultural Revolution, and the continuing belief in Maoist orthodoxy all contributed to the Chinese navy's lack of resources for modernization during the late 1950s and the 1960s.

After the Great Proletarian Cultural Revolution

In May 1975, however, at a meeting of the Central Military Commission (CMC), Mao Zedong reportedly directed the development of a modern navy, probably reacting to both the Soviet threat and the development of a powerful navy by China's ancient adversary Japan. Chinese interests threatened by the Soviet navy in the late 1970s and 1980s included SLOCs vital to Beijing's rapidly increasing merchant marine, as Moscow established a continual naval presence in the Indian Ocean and the northern Arabian Sea. The Soviet Pacific Fleet almost doubled in size during the 1970s and was upgraded by the assignment of Moscow's latest combatants, including nuclear-powered and nuclear-armed surface ships and submarines. Soviet merchant ships and fishing vessels were also omnipresent in Pacific waters historically vital to China's economic interests.

Several factors continued to impede development of a large, modern Chinese navy. The political aftershocks of the Cultural Revolution, as Hua Guofeng and Deng Xiaoping contested for leadership of post-Mao China, limited the resources devoted to military modernization. This struggle was not resolved until 1980, when Deng emerged on top. However, Deng reemphasized the navy's role as a coastal-defense force, a view retained throughout the first half of the succeeding decade. "Our navy," Deng asserted, "should conduct coastal operations. It is a defensive force. Everything in the construction of the navy must accord with this guiding principle."[44]

Naval growth also was limited by the disorder in China's economic and social structures that lasted beyond the end of the Cultural Revolution. This turmoil affected China's military-industrial complex, hindering modernization efforts in the PLA generally. Furthermore, the lesson of the 1979 "punishment" of Vietnam was sobering to the PLA, but this conflict did not involve significant naval efforts. Hence, the PLAN probably benefited only marginally from corrective budgetary measures that resulted.

Finally, the triangular play among China, the Soviet Union, and the United States meant that by 1980 Beijing could rely on the world's largest and most modern navy to counter the Soviet maritime threat. This argued against China's developing a similar force of its own. Furthermore, given the U.S.-Japanese security treaty, Beijing could subsume concern about future Japanese aggression within its strategic relationship with Washington.[45]

Major changes in China's domestic and international situation in the 1980s soon altered Beijing's view of the PLAN, and maritime power became a more important instrument of national security strategy by the end of the decade. Beijing's second maritime priority, after countering the Soviet threat, was securing offshore territorial claims. Taiwan was the most important of these, but the South China Sea was also significant. Although successful action against South

Vietnamese naval forces in 1974 resulted in Chinese possession of the disputed Paracel Islands, the fight itself indicated that other claimants to the islands and reefs of the South China Sea would not accede meekly to Beijing's territorial assertions. Furthermore, the Soviet naval base at Cam Ranh Bay was flourishing as the 1970s ended.

These factors contributed to a significant change in the South Sea Fleet's organization: the marine corps, first formed in 1953 but disbanded in 1957, was reestablished in December 1979 as an amphibious assault force and assigned to the southern fleet. The PLAN's slender amphibious assets were concentrated in the South Sea Fleet, which conducted "island seizing" exercises. In 1980, for instance, a major fleet exercise in the South China Sea focused on the seizure and defense of islands in the Paracel Archipelago.[46]

The South Sea Fleet's organization benefited from PLAN force-structure changes that, for the first time, centered on Chinese-built warships. Although still heavily reliant on Soviet designs, the Luda-class guided-missile destroyers, Jianghu-class frigates, and Houjian fast attack missile boats collectively marked a significant increase in China's maritime capability. The submarine force included the first Chinese-built nuclear-powered attack submarines, as well as about sixty conventionally powered boats. A seaborne nuclear deterrent force continued under development, following Mao's earlier declaration that the navy had to be built up "to make it dreadful to the enemy."[47]

Deng Xiaoping's Navy

Naval expansion and modernization were spurred during the 1980s by the coastal concentration of China's burgeoning economy and military facilities. Furthermore, the resources necessary for a modernized PLAN became available as a result of China's dramatic economic development and increasing wealth. Recovery from the Cultural Revolution, well under way by 1985, brought a reinvigorated, if less centralized, military-industrial complex.

Three events contributed prominently to the development of the navy in this decade. The first was Deng's evaluation of the military at an expanded CMC meeting in 1975 as "overstaffed, lazy, arrogant, ill equipped, and ill prepared to conduct modern warfare," an opinion strengthened by the PLA's poor performance during the 1979 conflict with Vietnam.[48] Second was Beijing's 1985 strategic decision that the Soviet Union no longer posed a major threat to China in terms of global nuclear war and that accordingly the PLA would have to be prepared instead for "small wars on the periphery" of the nation.[49] The emphasis on a "peripheral" (to a significant extent maritime) rather than continental strategic view improved the PLAN's leverage in obtaining resources within the PLA as a whole.

Third was the rise to prominence of Admiral Liu Huaqing. Liu had been schooled in the Soviet Union, had served most of his career in the science and technology arms of the PLA, and was close to Deng Xiaoping.[50] Liu exerted a strong force on development of the navy as its commander from 1982 to 1987 and vice chairman of the CMC until 1997. He is best known for promulgating a three-stage maritime strategy that provided justification on which PLAN officers and other navalists could base their plans for a larger, more modern navy. More important were his accomplishments in reorganizing the navy, redeveloping the marine corps, upgrading bases and research-and-development facilities, and restructuring the school and training systems.[51]

China's widening maritime concerns and increased budget resources in the 1980s favored PLAN modernization, which proceeded along three paths—indigenous construction, foreign purchase, and reverse engineering—much as had Li Hongzhang's "self-strengthening" navy initiative of a hundred years earlier. The 1980s program proceeded at a measured pace, but it created a new navy.

Construction included guided-missile destroyers and frigates, replenishment-at-sea ships, conventionally and nuclear-powered attack submarines, and support craft, including missile-tracking ships and officer-training vessels. Foreign purchases were concentrated in the West, with the United States selling China a small number of modern ship engines and torpedoes and Western European nations selling weapons and sensor systems, including Italian torpedoes, French cruise missiles, and British radars. The PLAN acquired its only Xia-class fleet-ballistic-missile submarine. The successful submerged launch in 1988 of the Ju Lang–1 (JL-1) intermediate-range ballistic missile from this submarine meant that China for the first time could deploy strategic nuclear weapons at sea.[52]

The PLAN demonstrated its increasing capability in other maritime missions as well during the 1980s. China invested in four large space-surveillance ships to support its growing military and commercial space program; these ships conducted the first long-range PLAN deployments, in support of space launches, in 1980. Task forces supported scientific expeditions to the Arctic and Antarctic. The PLAN's first foreign port visit was conducted in 1985, when two East Sea Fleet ships visited Bangladesh, Sri Lanka, and Pakistan; the officer-training ship *Zheng He* became the first PLAN vessel to visit the United States when it made a 1989 port call in Hawaii.

During the 1990s Beijing continued to expand and modernize the navy it had begun building in the 1970s, but again, at a measured pace. The PLAN engaged in a series of long-range deployments throughout East and South Asia, as well as deploying a three-ship task group to the Western Hemisphere in 1998, visiting the United States, Mexico, Peru, and Chile. Foreign purchases of improved ships, submarines, and aircraft earned the PLAN headlines as China acquired

Sovremenny-class guided-missile destroyers, Kilo-class submarines, and Su-27 fighters from Russia, but these constituted only incremental improvements to a large if still limited navy.

NOTABLE CONSISTENCIES AND CAUTIONARY MESSAGES

The communist regime recognized early on the need to deal with maritime issues, but only after thirty years and a dramatically altered international situation did China apparently acknowledge the necessity of a modernized navy. Beijing currently views "the ocean as its chief strategic defensive direction," since "China's political and economic focus lies on the coastal areas [and] for the present and a fairly long period to come, [its] strategic focus will be in the direction of the sea."[53]

The Chinese navy being built for the twenty-first century owes a good deal to its history, which has been marked by some notable consistencies. First has been recognition of the maritime element in China's national security. Second, Chinese naval efforts have been closely linked to the nation's economic development. Hence, continued naval modernization should be expected, in view of China's continuing economic boom.

Third, Chinese naval development since the eighteenth century has been marked by significant interaction with foreign navies. Qing-dynasty modernization efforts drew on Japanese, German, British, and American naval professionals as advisers, administrators, and engineers. This trend continued under the People's Republic of China, with a sporadic but pervasive reliance on Soviet/Russian advisers, strategy, equipment, technology, and engineers.

Fourth, the Chinese government has not hesitated to employ naval force in pursuit of national security goals. These efforts have not always been successful (witness the failed campaigns in 1884 against France and 1894–95 against Japan) but often they have been, as in 1950, 1954–55, and 1958 in the Taiwan Strait, and in 1974, 1988, and 1998 in the South China Sea. Beijing's willingness to resort to naval force even when significantly outgunned bears a cautionary message for foreign strategists.

Imperial China for the most part ignored the sea except for brief periods and specific campaigns. Republican China was simply too preoccupied with civil war and Japanese invasion to focus on naval development. The communist regime installed in 1949 maintained for almost fifty years a traditional Chinese attitude toward the navy as a secondary instrument of national power.

Mao Zedong recognized in 1950 that deploying a navy to conquer Taiwan required development of expertise in amphibious warfare, seaborne logistics, and maritime airpower, but his plan to organize a strong navy was aborted because of the Korean War and thereafter limited by domestic political events, especially the disastrous Great Leap Forward. Later, naval development was severely impacted

during the 1960s by the Sino-Soviet split and the Great Proletarian Cultural Revolution. Only at the end of the 1970s, following the end of the Cultural Revolution and the post-Mao power struggle, was the PLAN in a position to "take off."

That takeoff did not immediately happen, although the PLAN did benefit in the 1980s from a relatively close relationship with the United States, from which China purchased advanced naval systems, including LM2500 gas-turbine engines and Mark 46 antisubmarine torpedoes. The sanctions that followed the June 1989 Tiananmen Square massacre ended U.S. naval assistance, and China has since turned to Europe, Israel, and especially Russia. The following decades have seen a dramatic increase in China's naval capabilities.

Almost all of China's primary sovereignty concerns lie in the maritime arena: Taiwan; territorial and seabed resource disputes with Japan in the East China Sea; similar disputes with Vietnam, the Philippines, Brunei, Indonesia, and Malaysia in the South China Sea; and SLOCs across the Indian Ocean endangered by piracy in the Gulf of Aden. Additionally, the government's authority relies in significant part on continued economic growth, which in turn relies on maritime trade and energy flows.

Finally, Beijing's willingness to resort to force even when significantly outgunned should impart a cautionary message for strategists considering possible Chinese reactions to specific issues, especially Taiwan's efforts to resist reunification. While Beijing will continue to be constrained by American (and perhaps Japanese) naval force, it will not hesitate to employ the PLAN in situations involving sovereignty or other vital national security claims.

NOTES

An earlier version of this article was delivered to the U.S. Naval Academy's Seventeenth Naval History Symposium in September 2011 and will appear as chapter 11 of the selected proceedings of that symposium, *New Interpretations in Naval History,* forthcoming from the Naval War College Press.

1. This discussion relies on "CMC's Guo Boxiong Urges Improving PLA Capabilities to 'Fulfill Historic Missions,'" Xinhua, 27 September 2005, in Open Source Center CPP20050927320021, and Daniel M. Hartnett, *The PLA's Domestic and Foreign Activities and Orientation, Testimony before the U.S.-China Economic and Security Review Commission,* "China's Military and Security Activities Abroad" hearings, 111th Cong., 1st sess., 4 March 2009, available at www.uscc.gov/. The Central Military Commission (CMC) is the supreme military policy-making commission, issuing directives relating to the People's Liberation Army (PLA), including senior appointments, troop deployments, and arms spending. CCP senior leaders hold the CMC's most important posts. See *The Central People's Government of the People's Republic of China,* english.gov.cn/, for current CMC membership.
2. Quoted in Cui Xiaohuo and Peng Kuang, "Navy Chief Lists Key Objective," *China Daily,* 16 April 2009, www.chinadaily.com.cn/.
3. Deng Gang's *Chinese Maritime Activities and Socioeconomic Development, c. 2100 BC–900 AD* (Westport, Conn.: Greenwood, 1997) is a well-written history of this topic.

4. Joseph Needham's massive (six-volume) *Science and Civilisation in China* (Cambridge, U.K.: Cambridge Univ. Press, 1954–86) discusses these and related developments.

5. See "China's Sea Route to West Asia Begins in Xuwen," Xinhua, 21 June 2000, in Foreign Broadcast Information System [hereafter FBIS] CPP20000621000077, for an archaeological theory that trading voyages may have departed from Guangdong Province as early as 200 BC, two hundred years before the Silk Road was established; Deng, *Chinese Maritime Activities and Socioeconomic Development,* p. 41.

6. Paul C. Forage, "The Foundations of Chinese Naval Supremacy in the Twelfth Century," in *New Interpretations in Naval History: Selected Papers from the Tenth Naval History Symposium Held at the United States Naval Academy, 11–13 September 1991,* ed. Jack Sweetman (Annapolis, Md.: Naval Institute Press, 1992), p. 3.

7. Ibid., p. 70.

8. Lo Jung-pang, "The Emergence of China as a Sea Power during the Late Song and Early Yuan Periods," *Far Eastern Quarterly* 14, no. 4 (August 1955), p. 491.

9. See Forage, "Foundations of Chinese Naval Supremacy in the Twelfth Century," pp. 6–7, 19–21, for a fascinating account of two battles between Song and Yuan naval forces.

10. John K. Fairbank, "Maritime and Continental in China's History," in *The Cambridge History of China,* vol. 12, *Republican China: 1912–1949,* pt. I, ed. John K. Fairbank and Dennis Twichett (Cambridge, U.K.: Cambridge Univ. Press, 1983), p. 1:15.

11. Forage, "Foundations of Chinese Naval Supremacy in the Twelfth Century," pp. 500–501, provides a brief but interesting description of these early weapons.

12. Quote is from Jin Wu, in Richard Gunde, "The Voyages of Zheng He" (Los Angeles: UCLA Center for Chinese Studies, 20 April 2004), available at www.international.ucla.edu/. The Ming decision also reflected Chinese xenophobia, perhaps best expressed in the response of the Qing emperor Ch'ien-lung to Britain's 1793 attempt to establish relations with Beijing. The emperor told Lord Macartney, "We possess all things. I set no value on objects strange or ingenious, and have no use for your country's manufactures." The best work on Zheng He remains Edward L. Dreyer, *Zheng He: China and the Oceans in the Early Ming Dynasty, 1405–1433* (New York: Longman, 2006). See George Raudzens, "Military Revolution or Maritime Evolution: Military Superiorities or Transportation Advantages as Main Causes of European Colonial Conquests to 1788," *Journal of Military History* 63, no. 3 (July 1999), p. 56, for an interesting but Eurocentric interpretation of the role maritime mobility played in European imperialism.

13. John K. Fairbank, *China: A New History* (Cambridge, Mass.: Belknap Press of Harvard Univ., 1992), p. 220, relates the most famous case of corruption—the diversion of perhaps fifty million dollars in naval construction funds to the building of the empress's Summer Palace in Beijing, complete with a large boat made of marble.

14. Mary Clabaugh Wright, *The Last Stand of Chinese Conservatism: The T'ung-chih Restoration, 1862–1874* (Stanford, Calif.: Stanford Univ. Press, 1957), pp. 59–66, provides the most detailed description of the Sino-French War. The French had eight warships and two torpedo boats. The Chinese had eleven warships and several other craft, but all were made of wood. The French also destroyed the Chinese shore installations.

15. Bruce A. Swanson, *The Eighth Voyage of the Dragon: A History of China's Quest for Seapower* (Annapolis, Md.: Naval Institute Press, 1982), p. 96ff., discusses these developments.

16. Japan's success was simplified by the fact that the forts' guns were designed only to defend against threats from seaward. The British made the same defensive mistake in Singapore in 1941, and Japanese forces took advantage of it.

17. Swanson, *Eighth Voyage of the Dragon,* p. 223. China was only one of several countries building navies at this time: Great Britain, Germany, France, Italy, Russia, Japan, the United States, and even Austria-Hungary were all modernizing their fleets. Those that fell spectacularly short—China, Germany, Austria-Hungary—failed to develop meaningful strategic and operational frameworks for their new navies. William Ferdinand Tyler, *Pulling Strings in China* (London: Constable, 1929), tells some

colorful stories about another, more successful maritime force developed in China during the late nineteenth century. British naval officers operated most of the ships of the Revenue Service, established as part of the Customs Service, long supervised by Sir Robert Hart. Tyler, who was on board the Chinese flagship at Weihaiwei in 1895, characterized the navy as "a monstrously disordered epicyclic heterogeneity."

18. "The Chinese Navy," in *Shanghai Defense Force and Volunteers* (Shanghai: North China Daily Herald, 1929[?]), p. 1302.

19. This battle is described in Bernard D. Cole, *Gunboats and Marines: The U.S. Navy in China, 1925–1928* (Wilmington: Univ. of Delaware Press, 1982), pp. 89–90.

20. Swanson, *Eighth Voyage of the Dragon,* p. 157. The "Chinese" naval forces were actually those of Zhang Xueliang, the Manchurian warlord (the "Young Marshal") who had recently sworn allegiance to Chang Kai-shek's Nationalist government. The Chinese account of this battle quoted by Swanson ends with a Soviet victory due to superior firepower, including air strikes. There was also an October 1929 clash with Soviet forces over disputed boundaries.

21. The United States, for instance, used just two Navy transports and a commercial passenger liner to move a regiment of Marines from the United States to the Far East, and then between the Philippines and China and between northern and southern China, as crises waxed and waned.

22. PLAN vice commander Zhou Xihan, 1957, quoted in David G. Muller, Jr., *China's Emergence as a Maritime Power* (Boulder, Colo.: Westview, 1983), p. 47.

23. Larry M. Wortzel, "The Beiping-Tianjin Campaign of 1948–49: The Strategic and Operational Thinking of the People's Liberation Army" (paper prepared for the U.S. Army War College's Strategic Studies Institute, Carlisle, Pa., n.d.), chart 1, points out that by July 1949 the PLA actually included seventy-seven "naval vessels." Gene Z. Hanrahan, "Report on Red China's New Navy," U.S. Naval Institute *Proceedings* 79, no. 8 (August 1953), p. 847, describes the Nationalist contribution to this force as "twenty-five vessels ranging from LCTs [tank landing craft, about 120 feet long, 260 tons] to destroyers, representing an estimated one-fourth of the total Nationalist naval force."

24. Gen. Zhang Aiping, quoted in Hanrahan, "Report on Red China's New Navy," p. 848. See Bernard D. Cole, *Taiwan's Security: History and Prospects* (London: Routledge, 2006), chap. 2, for an account of KMT activities during this period.

25. Quoted in Shu Guang, *Mao's Military Romanticism: China and the Korean War, 1950–1953* (Lawrence: Univ. Press of Kansas, 1995), p. 51.

26. Hanrahan, "Report on Red China's New Navy," pp. 46–54, provides a useful description of the beginnings of the PLAN. Muller, *China's Emergence as a Maritime Power,* p. 13, estimates that approximately two thousand former Republic of China naval personnel defected to the communist regime in 1949 and formed the core of the nascent PLAN.

27. The Chinese missions to Moscow are discussed, in some cases with verbatim accounts, in "Inside China's Cold War," *Cold War History Project Bulletin,* no. 16 (Fall 2007 / Winter 2008) (edited by Christian Ostermann, at the Woodrow Wilson Center, in Washington, D.C.). Probably the most complete account of PLAN Taiwan Strait operations in this period is He Di, "Last Campaign to Unify China: The CCP's Unmaterialized Plan to Liberate Taiwan, 1949–1950," *Chinese Historians* 5 (Spring 1992), p. 8. Its author worked at the Institute of American Studies of the Chinese Academy of Social Sciences and presumably had good access to PLA archives while researching this article.

28. Raymond V. B. Blackman, ed., *Jane's Fighting Ships: 1955–56* (London: Jane's Fighting Ships, 1956), p. 151ff., provides these numbers, but they should be treated as estimates. Swanson, *Eighth Voyage of the Dragon,* p. 196, describes such massive projects as a fortified "250-mile, 10-foot-wide communication trench paralleling the southern bank of the Yangtze River from Wusong to Jiujiang up river," noting that a "similar trench was constructed along the coast south of Shanghai for about 200 miles."

29. He, "Last Campaign to Unify China," p. 2, points out that Mao postponed the date for assaulting Taiwan several times as PLA failures against various offshore islands emphasized the additional time required to prepare for a successful large-scale amphibious assault. Muller, *China's Emergence as a*

Maritime Power, p. 16, gives August 1951 as the planned invasion month.

30. He, "Last Campaign to Unify China," p. 4. Edward J. Marolda, "U.S. Navy and the Chinese Civil War, 1945–1952" (PhD diss., George Washington University, 1990), p. 139, states that by spring 1950 Beijing "had assembled a motley armada of 5,000 vessels . . . freighters, motorized junks, and sampans" for the invasion of Taiwan; these vessels were to be crewed by "30,000 fishermen and other sailors."

31. See Robert J. Donovan, *Tumultuous Years: The Presidency of Harry S Truman, 1949–1953* (New York: W. W. Norton, 1983), p. 206, for Truman's decision to reposition the Seventh Fleet, and p. 241ff. for a good account of administration (i.e., Truman, Acheson, Bohlen, et al.) thinking about the implementation of NSC-68, which effectively rearmed the United States for the Cold War and potential global war with Soviet-led communist forces: "On the last day of July 1950, Truman and Acheson had a talk about grand strategy. The eyes of the American people were glued to Korea. . . . The president and the secretary of state fixed their gaze on the Rhine and the Elbe." The Chinese reaction is in Mao Zedong, "Speech Delivered at the Eighth Meeting of the Government Council of the People's Republic of China, 28 June 1950," in Jerome Ch'en, *Mao,* ed. Gerald Emanuel Stearn (Englewood Cliffs, N.J.: Prentice Hall, 1969), p. 115. A contrary but very credible view of U.S. intentions is provided by Bruce A. Elleman, *High Seas Buffer: The Taiwan Patrol Force, 1950–1979,* Newport Paper 38 (Newport, R.I.: Naval War College Press, April 2012), esp. chap. 1, available at www.usnwc.edu/press/.

32. Quoted in Marolda, "U.S. Navy and the Chinese Civil War," pp. 119–20.

33. Fred L. Israel, ed., "Dwight D. Eisenhower: First Annual Message," in *The State of the Union Messages of the Presidents, 1790–1966,* vol. 3, *1905–1966* (New York: Chelsea House, 1967), p. 3015. In his 2 February 1953 State of the Union Address to Congress, Eisenhower commented that "since the 'Red Chinese' had intervened in the Korean War, he felt no longer any need to 'protect' them from an invasion by . . . Chiang K'ai-shek."

34. Swanson, *Eighth Voyage of the Dragon,* p. 187.

35. *Dangdai Zhonggun Haijun* (Beijing: China Social Services Publishing House, 1987), translated as *China Today: The People's Navy* [hereafter *People's Navy*] in FBIS, JPRS-CAR-90-014 (16 July 1990), p. 7.

36. Ibid., p. 10, also notes that the Soviet ships were designed for a northern climate and had some difficulty operating in the warmer waters of the East and South China Seas, difficulty that is still a concern with the *Sovremenny*-class guided-missile destroyers purchased by China.

37. Gordon Chang and He Di, "The Absence of War in the U.S.-China Confrontation over Quemoy and Matsu in 1954–1955: Contingency, Luck, Deterrence?," *American Historical Review* (December 1993), p. 1514, describes this action, during which "10,000 PLA troops . . . overwhelmed 1,086 Kuomintang soldiers."

38. *People's Navy,* pp. 36–37. Kenneth W. Allen, Glenn Krumel, and Jonathan D. Pollack, *China's Air Force* (Santa Monica, Calif.: RAND, 1995), p. 205 note 11, also app. E, pp. 221–29, for useful descriptions of PLA aircraft-acquisition programs. Swanson, *Eighth Voyage of the Dragon,* p. 205, estimates 470 aircraft; a reasonable assumption is that the navy's air arm has flown older variants of PLA Air Force aircraft.

39. Other islands remained under Taiwan's control, including the Pratas Islands and Itu Aba in the South China Sea. Taiwan's attacks on the mainland continued into the 1960s. The Taiwan Strait naval campaigns are addressed in Li Xiaobang, "PLA Attacks and Amphibious Operations during the Taiwan Straits Crisis of 1954–58" (paper presented at the Center for Naval Analyses [CNA] Conference on the PLA's Operational History, Alexandria, Virginia, June 1999), and Alexander Huang, "PLA Navy at War, 1949–1999: From Coastal Defense to Distant Operations" (paper presented at the same conference). Thomas Torda, "Struggle for the Taiwan Strait: A 50th Anniversary Perspective on the First Communist-Nationalist Battles for China's Offshore Islands and Their Significance for the Taiwan Strait Crises" (unpublished manuscript, 1999), describes these early battles, which included PLA successes as well as failures. Also see Alexander Huang, "Evolution of the PLA Navy and Its Early

Combat Experiences" (paper presented at the CNA Conference on the People's Liberation Army Navy, Washington, D.C., April 2000), p. 3, for a tabular summation of the PLAN's war-fighting efforts during this period. Chang and He, "Absence of War in the U.S.-China Confrontation," pp. 1504, 1510 notes 7–8, documents this.

40. Raymond V. B. Blackman, ed., *Jane's Fighting Ships, 1970–1971* (London: Jane's Yearbooks, 1970), p. 610, credits the Soviet Navy with just four large (four-thousand-ton displacement) and eighty smaller (six hundred to a thousand tons) amphibious ships spread out among all of the Soviet Union's four fleets, from the Pacific to the Baltic.

41. *People's Navy* repeatedly emphasizes the deleterious effects of the Cultural Revolution. John R. O'Donnell, "An Analysis of Major Developmental Influences on the People's Liberation Army-Navy and Their Implication for the Future" (master's thesis, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 1995), p. 42, lists the PLAN's political commissar, chief operations officer, the East Sea Fleet commander, two deputy commanders, and two fleet political commissars among the "120 senior naval officers and thousands of lower ranking personnel [who] were purged." Also see John Wilson Lewis and Xue Litai, *China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age* (Stanford, Calif.: Stanford Univ. Press, 1994), p. 206ff, who note that not even Zhou Enlai was able to protect these programs completely.

42. Quoted in *People's Navy,* p. 13.

43. Cited in Muller, *China's Emergence as a Maritime Power,* p. 154.

44. Lewis and Xue, *China's Strategic Seapower,* p. 223, discusses Hua's decision; Deng is quoted on p. 224.

45. Fred Hiatt, "Marine General: U.S. Troops Must Stay in Japan," *Washington Post,* 27 March 1990, p. A14, quoted Lt. Gen. Henry Stackpole, U.S. Marine Corps, commander of III Marine Expeditionary Force on Okinawa, as describing the United States as "a cap in the [Japanese] bottle," a statement I confirmed in conversation with Lieutenant General Stackpole.

46. Tai Ming Cheung, *Fortifying China: The Struggle to Build a Modern Defense Economy* (Ithaca, N.Y.: Cornell Univ. Press, 2009), p. 28. China's marine corps, disestablished in 1957 as "unnecessary," was reestablished in 1980. The concentration of amphibious forces in the South Sea Fleet continues in 2012, indicating that PLAN amphibious planning is aimed more at the South China Sea than at Taiwan.

47. John E. Moore, ed., *Jane's Fighting Ships: 1976–77* (New York: Franklin Watts, 1977), p. 100ff. The PLAN also included the first Chinese range-instrumentation ships for tracking guided-missile flights and the first Chinese-built amphibious ship. Mao is quoted in Muller, *China's Emergence as a Maritime Power,* p. 171.

48. Deng Xiaoping, "Speech at an Enlarged Meeting of the Military Commission of the Party Central Committee," 14 July 1975, in Joint Publications Research Service *China Reports,* no. 468 (31 October 1983), pp. 14–22 (website now discontinued).

49. Alfred D. Wilhelm, *China and Security in the Asian Pacific Region through 2010,* CRM 95-226 (Alexandria, Va.: CNA, 1996), p. 42.

50. John W. Lewis, *China Builds the Bomb* (Stanford, Calif.: Stanford Univ. Press, 1988), pp. 50–51; Liu had worked for Deng on at least two previous occasions.

51. Liu's accomplishments are summed up in Wilhelm, *China and Security in the Asian Pacific Region through 2010,* p. 43.

52. Lewis and Xue, *China's Strategic Seapower,* provides the best account of the fleet-ballistic-missile and JL-1 programs. A successful launch was made in 1982 from a submerged platform; a 1988 attempt from the submarine probably succeeded. The single Xia itself has been an operational failure, never operating on a regular basis. The boat apparently received an extensive overhaul—probably involving recoring the propulsion plant—that enabled it at least to participate in the April 2009 naval review conducted by China to celebrate the PLAN's sixtieth anniversary.

53. Lt. Gen. Mi Zhenyu, PLA, "A Reflection on Geographic Strategy," *Zhongguo Junshi Kexue* [China Military Science], no. 1 (February 1998), pp. 6–14, in FBIS-CHI-98-208. A brief popular view of China's maritime history was published as "Special Report: China Marks 60th Anniversary of Navy," Xinhua, 24 April 2009, news.xinhuanet.com/.

A THEORY OF NAVAL AIRPOWER

Robert C. Rubel

The U.S. Navy has never been comfortable with theory or doctrine at what is now known as the operational level of war. The Navy has always possessed robust ship- and formation-level doctrine—tactics—and of course has embraced the high-level sea-power theories of both Alfred Thayer Mahan and Julian Corbett. The gap in the middle either has not been needed—as has been essentially the case for most of the Navy's history except for World War II—or has been filled by adaptive practice in the form of specific campaign or operations plans. For the Navy, the old framework of strategy and tactics has sufficed since 1945. However, an emergent set of circumstances in the form of Chinese naval development, as well as a new generation of weapons and sensors, is driving the Navy into incorporating the operational level into its culture. Moreover, this development is bringing the Navy into competition, or perhaps conflict, with the U.S. Air Force over which should exert operational control of aviation over the water. Whereas this task was always presumed to be the preserve of the Navy, the establishment in Hawaii of a regional Air Operations Center (AOC) that in theory controls all air in the theater will challenge Navy assumptions and equities. The tactics of interservice squabbling aside, the Navy will need a theory of naval airpower as a foundation for its arguments to preserve operational control of its aviation.

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An operational-level theory of naval airpower must be derived from practice—how it has been used and why it has been successful. Naval aviation is a subordinate element of American sea power and, as such, has established no separate theoretical basis for either its own justification or employment. While this theory vacuum has kept it from advancing its command-and-control doctrine the way the Air Force has, it has produced a flexibly minded organization that is very good at adapting to novel operational circumstances. In contrast to airpower theory as interpreted by the Air Force, naval aviation has never linked itself to an a priori mechanism for strategic victory or regarded itself as an independent strategic weapon. Nonetheless, as the Navy transitions to the operational-level Joint Force Maritime Component Commander / Maritime Operations Center (JFMCC/MOC) framework for its command and control (C2), a theory is needed both to guide the development of C2 doctrine and to make the case for maintaining operational control of naval aviation within Navy lifelines.

Naval aviation, for the purpose of theory and doctrine, can be divided into the following categories:

- *Carrier air wings:* the airframes, both fixed- and rotary-wing, manned and unmanned, that operate from the deck of an aircraft carrier
- *Land-based naval aviation:* maritime patrol planes and electronic-warfare aircraft
- *Organic surface-combatant aircraft:* manned and unmanned helicopters and small, fixed-wing unmanned aircraft
- *Organic Marine aviation:* fixed- and rotary-wing aircraft attached to embarked Marine units.

These categories omit much—aircraft for training, logistics, test and evaluation, etc. Such aviation elements can be thought of as infrastructural support and are not directly parts of theory.

Three kinds of naval operations have relevance to the development of naval aviation theory: seizing, maintaining, and exercising command of the sea; performing sea control; and bombarding targets ashore, to include support of amphibious and ground operations. In the early part of the Cold War, nuclear-warfare operations would have been included as a distinct kind of operation that affected theory and doctrine, but these days that burden falls on the submarine force.

The single most important concept in terms of defining a theory of naval airpower that is distinct from land-based-airpower theory is that naval aircraft are essentially extensions of ship weapons and sensors. Two key characteristics of aircraft produce their utility: the ability to see farther from altitude and the ability

to deliver ordnance beyond the visual horizon. The whole logic of naval aviation development stems from these two characteristics.

Being fused to basic naval theory, naval aviation theory is influenced by the three traditional "Fleet Rules" governing fleet operations—rules that are not, however, explicitly codified in any existing doctrine:

> *Fleet Rule 1:* Keep the fleet concentrated (strategically). If there is an opposing fleet, dispersing your own fleet (other than tactically) invites defeat in detail.[1]
>
> *Fleet Rule 2:* Do not become decisively engaged with land-based forces unless you are decisively superior in strength. Generally speaking, land-based forces can generate a greater rate of fire per unit time than naval forces of equal strength can, so the latter must compensate by bringing larger forces to bear. Moreover, air bases on land are easier and cheaper to reconstitute than sunk or badly damaged carriers.
>
> *Fleet Rule 3:* Do not compromise the mobility of the fleet. At sea, striking effectively first is the key to victory. Achieving this means either having longer-range weapons than does the enemy or being able to find him first and strike before he finds you. Sacrificing mobility by tying the fleet to a geographic point increases the odds that *you* will be found and struck first.

Any of these rules may be broken or ignored if conditions allow, but breaking them when there is significant opposition is a recipe for losing ships. All of these rules have applied to everything from fighting sail to aircraft carriers, but in the case of carriers they result in a particular structure of logic. From these rules, in part as manifested in the Pacific in World War II, we can identify four levels of at-sea aviation capability.

Level 1: An Air Fleet

At a certain level of aggregation, naval airpower becomes an air fleet. In World War II this meant at least six aircraft carriers operating together, such that there were over four hundred aircraft available. A force of this size had two key characteristics not shared by a smaller grouping:

- It could multitask. Whereas a smaller force would have to make risky mission trade-offs, a carrier air fleet could mount a robust defense at the same time it was conducting robust offensive strikes. It could search and have a strong strike package at the ready at the same time.
- It could stand and fight against strong land-based air forces, whereas a smaller group would be forced to conduct hit-and-run raids.

The number of today's aircraft carriers needed to create a naval air fleet is not known, but it is liable to be a function of the opposition arrayed against it. The United States grouped four carriers in the Persian Gulf for DESERT STORM, but there was no opposition, and their sortie numbers were dwarfed by those of the Air Force. The effectiveness of a large grouping of carriers against Iran is one thing, against China quite another. (It may even prove to be the case that against a modern anti-access/area-denial [A2/AD] array—one that includes antiship ballistic missiles, numerous submarines, and dispersed surface craft packing three-hundred-nautical-mile antiship missiles—the concept of a naval air force is irrelevant.)

The air fleet obeys Fleet Rule 1—strategic (and operational) concentration. It is this concentration that allows the air fleet to comply with the "decisively superior" provision of Rule 2 and therefore be able to break Rule 3 with acceptable risk, as did the U.S. Fifth Fleet in the Marianas and at Okinawa in World War II.

Level 2: Carrier Strike Force

At numbers below those of an air fleet, carriers essentially break Fleet Rule 1, which makes breaking the other two rules risky, if not suicidal. This was precisely the case for the Japanese Kido Butai at Midway. Four carriers were not enough to strike Midway, search effectively, defend the force, and be ready to strike American carriers if they showed up unexpectedly, all at the same time. The Japanese broke Rule 3, by linking themselves to Midway, and disaster resulted.

The carrier strike group, consisting of one carrier and its escorts—or its variant the strike force, consisting of two or more carriers and their escorts—has been the staple of U.S. Navy operations since the end of World War II. A theory of naval airpower at this level of aggregation (or dispersal) requires an examination of the mission roles that aircraft carriers perform.

Role 1: Eyes of the Fleet. In the early years of naval aviation, aircraft performance was insufficient for carrying meaningful bomb loads for meaningful distances. However, aircraft could spot the fall of rounds from major-caliber guns far more effectively than could sailors high in the upper works of battleships. This role morphed into organic scouting as the carriers became strike platforms. The scouting function remained active with respect to the escort carriers that populated the hunter-killer groups covering the mid-Atlantic gap unreachable by land-based patrol planes during the Battle of the Atlantic in World War II. After the war, the scouting function was subsumed by the other roles the carriers performed.

It should be noted that this role might resurface for aircraft carriers. Instead of going forward into waters covered by A2/AD systems, carriers might support surface and subsurface operations from the outside by operating long-range, high-endurance unmanned aircraft to conduct search and, perhaps more

importantly, provide electronic relay to support line-of-sight communications if satellites are taken down.[2]

Role 2: Cavalry at Sea. After the Pearl Harbor attack the United States did not have the wherewithal to mount a concentrated attack on Japan. That had to wait for the arrival of new-construction ships, which would not start arriving in numbers until 1943. From May to November 1942 the carriers fought cliff-hanger battles that so depleted both sides that by the end of November the American and Japanese navies were each reduced to one fully operational carrier. Between these engagements the few available U.S. carriers in the Pacific were employed in hit-and-run raids. The Doolittle Raid was the most famous of these. They were in no position to stand and fight against the Japanese navy or even island air bases; since they could not concentrate, they had to observe Fleet Rules 2 and 3 scrupulously. In this sense they were used in a way not unlike the Civil War operations of the Confederate cavalry general Nathan Bedford Forrest.

Role 3: Capital Ship. In World War II, carriers fought for command of the sea and thereby replaced the dreadnought as the true capital ship. They have retained that role to the extent that they are deployed around the periphery of Eurasia to help enforce the international order.[3] In this role the carrier must obey the three Fleet Rules if there is any opposition at sea. The utter absence of even potential opposition since the fall of the Soviet Union has generated the illusion that American carriers are all-powerful. The danger is that the illusion could be crushingly shattered if the U.S. Navy, out of habit, breaks the rules in the face of, say, the Chinese navy. The effectiveness of the modern aircraft carrier as a capital ship in an age of nuclear submarines, antiship missiles, space, and cyber has not been tested. This fact should be respected.

Role 4: Nuclear-Strike Platform. The Navy adopted this mission in the late 1940s in response to Air Force assertions that the B-36 and nuclear bombs had made the Navy irrelevant except for convoy escort. By the mid-1980s this mission had faded out for naval aviation as the ballistic-missile submarines came online, along with nuclear-tipped cruise missiles. Meanwhile, as nuclear-strike platforms, carriers operated outside the framework of the three Fleet Rules. They dared not concentrate; their sole imperative was to survive long enough to launch their nuclear strikes.

Role 5: Airfield at Sea. When the North Korean army invaded South Korea in 1950, the only weapons at the immediate disposal of General Douglas MacArthur were several aircraft carriers, which saved the day by launching interdiction sorties until the Army and Air Force could show up in strength. Carriers served in the same way—first on station, ready on arrival—in DESERT SHIELD and the first

Afghanistan campaign. Essentially those carriers functioned as airfields at sea. By definition this role requires the breaking of Fleet Rules 2 and 3; moreover, because of the strategic circumstances of the Cold War and after, adherence to Rule 1 was unfeasible. Thus if a carrier is to function as an airfield at sea, no threat can be tolerated. U.S. carriers have functioned in this role frequently and with impunity since World War II. Institutional complacency about this state of affairs led to the disregard of war-at-sea capability, a disregard for which the Navy almost paid in 1973, when the Yom Kippur War erupted. The Sixth Fleet's carriers found themselves confronted in the eastern Mediterranean by a numerically superior Soviet fleet that possessed both antiship missiles and a doctrine for using them.[4] The U.S. carriers had neither suitable weapons nor viable tactics for antiship engagements.

The dangers of trying to employ carriers as airfields at sea when there is an appreciable threat must be understood and taken into account. Whatever roles they are performing, carriers are inherently capital ships and should not be risked unless command of the sea is at stake, which is almost never the case when support for land operations is the mission.

Role 6: Geopolitical Chess Piece. Aircraft carriers have a glorious battle history; they are big, powerful, and glamorous. All of this makes them exceptionally useful for various forms of naval diplomacy, both friendly and coercive. Moreover, uniquely among U.S. forces, they are ready on arrival to conduct combat operations without the buildup of logistics. American presidents can move them around the seas like queens on a giant chessboard. Without getting into the effects of such moves, we can say that the acceptable risk profile is much the same as that of the airfield-at-sea role. All three Fleet Rules usually must be violated, but especially Rule 3, violation of which is inherent in the role. As with the airfield role, the United States has become accustomed to its carriers performing this function with impunity, so much so that it has become habitual, and perhaps worse, the assumption of impunity has become embedded in the Navy's corporate culture.

Level 3: Aviation-Capable Ships

Aviation-capable ships are generally those with flight decks that run the length of the ship (i.e., "through decks"), allowing them to operate a wing of helicopters and short-takeoff/vertical-landing jets. The U.S. versions are the large amphibious ships that embark Marine Corps aviation units. The specialized function of these ships and wings is to support Marine expeditionary operations. Thus these ships are built to perform a miniversion of the airfield-at-sea role, and that role's acceptable-risk profile applies. Other navies have added ski jumps forward to allow added takeoff weight, and some have arresting gear, to avoid the performance

penalties of vertical landing. Countries building such ships call them "aircraft carriers," but an analysis of their capabilities reveals they are only marginally, if at all, capable of performing any of the six carrier-mission roles. Their limitations are such that they are classed here as aviation-capable ships rather than true aircraft carriers.

Having identified the limitations of the ship type, we must nonetheless also acknowledge its potential strategic utility in certain defined circumstances. First, by calling these ships carriers countries can claim membership among the naval elite, thus serving the cause of naval nationalism. True carriers or not, they are powerful sources of pride, as evidenced by the Chinese public's enthusiasm for the People's Liberation Army Navy's *Liaoning,* a refurbished Russian aviation-capable ship. More objectively, the aviation capability of these ships makes them flexible and more broadly capable than a surface combatant or amphibious ship without a through deck. They can provide instrumentality in everything from disaster relief to gunboat diplomacy. Since even these ships are very expensive to build and operate, countries will only have one or two, making their employment beyond their home waters rare and episodic.

Included in this category are the recent classes of Japanese "destroyers" that have through decks. The destroyer description was adopted for political reasons, but does suggest that the primary function of the embarked air wing (helicopters only at this point) is antisubmarine warfare (ASW) and sea control.[5] In this sense they are first cousins to the old Soviet *Kiev* class of aircraft-carrying "cruisers," so called to sidestep the strictures of the Montreux Convention (which prohibits the passage of aircraft carriers through the Dardanelles and Bosporus, linking the Black Sea with the Aegean). Indeed, since the Soviets were unable to build an even modestly capable vertical-takeoff-and-landing jet, the only viable use for those ships was ASW. However, a through deck, ski-jump bow or not, provides the potential for operating a few tactical jets, if they have the required performance. Whatever the basic utility of doing so, however, these ships are limited by their inability to operate fixed-wing early-warning aircraft, having to rely instead on helicopters equipped for the role—a far inferior solution.

Level 4: Ships with Helicopter Decks

Most modern combatants feature decks aft from which they can operate an embarked helicopter or two or with which they can serve as "lily pads" for visiting helicopters. Either way, this aviation capability greatly increases the ship's reach, security, and ability to stay at sea. The advent of unmanned aircraft further extends the aviation potential of surface combatants, in a sense reprising the catapult-launched floatplanes that were found on battleships and cruisers in World War II. The small Scan Eagle unmanned aerial vehicle (UAV) has become almost

ubiquitous on board U.S. destroyers and has proved extremely useful in scouting and surveillance. However, this organic aviation capability on board surface combatants does not elevate those ships into the arena of naval aviation theory; their flying machines simply make them more capable surface combatants. Having said this, if aircraft flying off surface combatants were to be networked into the operations of carrier air wings, their relevance to theory might change.

Land-Based Naval Aviation

Taken as a whole, most naval aviation in the world is land based—aircraft functioning either as scouts or as virtual extensions of coastal artillery. Their purpose is to exert control over the seas over which they can fly. This was their key mission in the Battle of the Atlantic in World War II. In the Pacific, the United States used long-range aircraft to scout the seas looking for Japanese naval forces, supplementing or replacing carrier-based scouts, depending on the situation. Both the Japanese and Americans also used land-based medium bombers and tactical fighters to find and destroy enemy ships. While imposing attrition on the enemy is a desired goal at times, the real effect of land-based aviation is to create "no-go" zones for capital ships. In this they are behind the rationale for Fleet Rule 2.

For all the real and potential ability of land-based naval aviation, there has always been a disconnect between it and embarked naval aviation. Part of the reason involves "tribal" differences in culture, and part is in the dichotomy in missions. However, there have been occasions on which the two aviation arms should have worked in coordination. The 1980s Maritime Strategy provided for moving an aircraft carrier northward into Vestfjord, in Norway. It was supposed to find sanctuary there from Soviet air-launched antiship missiles, as the hills of the long seaward peninsula would disrupt radar seekers. However, if it was to get up to Vestfjord without falling prey to a lurking Soviet submarine, there had to be an antecedent area-ASW effort—mounted by patrol planes flying out of Iceland. The Soviets, analyzing the problem, assigned the long-range Su-27 Flanker fighter to the campaign as a patrol-plane killer. When the need for providing fighter protection for the patrol planes was raised in the U.S. Navy, the carrier fighter community refused to entertain the idea, not wanting even to talk to the patrol community. Fortunately, the Vestfjord scheme never had to be activated.[6]

THE THEORY OF SCOUT BOMBING

At first glance, scout bombing seems an obsolete concept, right out of World War II, and out of place in this discussion. However, this element of theory provides important insights into the potential dynamics in the application of naval aviation in a war-at-sea situation. Scouting has always been a critical function in naval war fighting, from frigates in the age of sail to floatplanes operating from battleships

in World War II and the Scan Eagles of today. In lieu of an ability to identify ships on radar returns or from space, human eyes must be employed to build a picture of surface traffic in a specified section of ocean. Normal Navy practice has been for land-based patrol planes, embarked tactical aircraft, surface combatant helicopters, or UAVs to fly out and identify radar contacts. In peacetime this is a benign and routine procedure, if somewhat inefficient. However, in crisis or in wartime it becomes scouting, and a particular logic attends its practice.

In an era of long-range antiship missiles, it is imperative that a battle-group commander have a complete and accurate picture of surface activity, perhaps out to three hundred nautical miles or more from the carrier. Although satellite-based information of various kinds can be enormously useful for cueing, it cannot produce the kind of detailed information that a set of human eyes on the scene (in person or via UAV sensors) can and that is needed for a positive identification. Getting positive identifications necessitates dispersal of aircraft widely—and singly. If a hostile or potentially hostile combatant is detected, scout-bombing logic comes into play.

Let us first assume a situation in which hostilities have commenced and the rules of engagement allow preemptive attack on enemy units. If the air-wing doctrine requires a coordinated antiship strike involving four to eight aircraft, word must be passed from the scout making the identification, a decision to strike made (perhaps in the context of an ongoing battle group defense), and either a strike force (of aircraft waiting on deck on alert) launched or aircraft already airborne assembled. Depending on the distance to the target, there may be up to a half-hour's delay before the strike arrives. This is enough time for the enemy to react or prepare in a number of ways. But what if the scout aircraft carried its own antiship missiles? These would have to be short-range and relatively light, so they could be brought back on board the carrier without incurring too great a fuel penalty for the aircraft. *By definition,* if the scout is still alive to identify the enemy at, realistically, a maximum of about eight miles, it can get off a shot. The shot may not sink or disable the enemy ship, but it might do enough system damage to make it less of a threat. Of course, if the ship has surface-to-air missiles, the minute the scout breaks the radar horizon—at, say, thirty nautical miles if at low altitude—it becomes vulnerable to these systems. Magnifying optical or infrared systems on the scout may shorten this vulnerability window by allowing identification not long after it breaks the radar horizon. In such a case the aircraft is functioning as a true extension of ship sensors and weapons.

A major advantage of this arrangement is that it fuses the sensing, identification, and attack functions, so the "observe, orient, decide, act" loop is very quick. Second, it meets international-law requirements on two counts: positive

identification of the target and a human (a moral agent) to make the firing decision. In addition, such delegation reduces the decision-making load on the battle group's Composite Warfare Commander (CWC), its chief tactical officer.

In a crisis in which, however, adversary units have not been generally designated as hostile, the issue becomes one of control. To what degree can firing authority be delegated to aircrews? Of course, the basic posture would be to require permission from the CWC to fire, unless the enemy unit fires first. There are many possible variations, and there is always the question of the adequacy of communication between the scout and CWC. However, risk in this kind of situation can be managed by issuing tactical doctrine telling aircrews what to do if a potential hostile unit is identified—perhaps to retreat immediately over the horizon, shadow the adversary, and await orders. Even in this case, the option of instant strike remains available.

A coordinated strike of any kind is predicated on the idea that one aircraft either cannot get through enemy defenses or cannot carry sufficient firepower to produce the desired effects. Neither of these things applies in the case of scout bombing. The logic of coordinated strike is antithetical to the logic of local sea control, where dispersal for coverage is the most important factor. Conversely, in an age of antiship missiles, achieving a coordinated-time-on-target salvo from different directions suggests dispersion of firing units. The difficulty of shooting down modern antiship cruise missiles places a premium on disrupting the salvo at its source. This again suggests scout bombing, especially in a brink-of-war situation. A robust scout-bombing posture might even have deterrent value—at a minimum, the enemy's hand will be tipped if it shoots at a scout bomber. This logic was the basis for Sixth Fleet "bird-dog" tactics used in the standoff with the Soviet fleet during the 1973 Yom Kippur War, in which carrier aircraft orbited above Soviet units, watching for missile launches from their decks. Interestingly, the increased endurance, stealth, and enhanced electronics of the F-35 Lightning II suggest it would be good in this role. Perhaps even better would be a form of the X-47 unmanned combat air vehicle; its high endurance and stealth, coupled with its carrying no crew, might make it an excellent scout bomber if equipped with the right kind of short-range missile. Of course, the difficult parts would be connectivity and an autonomous rule set.

The idea that modern war at sea will be like carrier battles in the Pacific in World War II must be discarded. American carriers will not be fighting a counterpart fleet of carriers but rather an array of land- and sea-based missile platforms. The United States has no choice but to concentrate naval airpower in large nuclear-powered aircraft carriers, but their air wings, for sea-control purposes, will need to spread out as much as possible. Attempting to saturate defenses with aircraft is, given the relatively small numbers of naval fighters available, precisely

the wrong approach. Each fighter must have the capability to disable or disrupt one surface unit.

As newer, more capable sensors and weapons enter the fleet, they might change the whole equation with an ability to get positive identifications against noncooperative vessels (perhaps actively trying to look to nonvisual sensors like merchant ships) at greater ranges, and at the same time to carry long-range antiship missiles. At that point fixed-wing tactical aircraft may not be needed at all to exert sea control but could be used for other functions, perhaps easing the opportunity-cost dilemma that has always attended carrier flight operations at force aggregations below the level of an air force at sea.

THE THEORY OF FLEET DEFENSE

In the Cold War, the Navy developed for defending carrier battle groups against Soviet air attacks a robust doctrine called "vector logic."[7] It established a circular grid, not necessarily centered on the carrier, within which fighters could be moved like chess pieces. The premises of this doctrine were, first, that the sky is big and fighters are few, and second, that it is far more effective to shoot down bombers before they can launch their antiship missiles than to try to stop the missiles later. The details of this doctrine need not be examined to understand that it was inherently tactical. Fleet defense is a broader matter than just protection of the aircraft carrier, but that element is central if carriers are present.

If we go back to the Vestfjord scheme, we can see how the matter of fleet defense takes on operational-level overtones. Recall that patrol planes operating out of Iceland were to sweep the Norwegian littoral of Soviet submarines, allowing the carrier to move up to its bastion without being torpedoed. But the patrol planes themselves were at risk and needed fighter cover. Cascading requirements set the dimensions of a major naval operation, one whose effects were intended to be strategic. Ultimately, naval air strikes on the Kola Peninsula would take down Soviet air defenses, paving the way for Air Force B-52s. They, in turn, were supposed to force the Soviets to divert forces from their offensive in the "Central Region"—that is, against Western Europe. As for the early step of defending the patrol aircraft clearing the way for the carrier steaming north to its haven, since land-based NATO air forces in Norway would presumably be occupied with other requirements and in any case not trained to conduct protection of an air ASW effort, U.S. Navy carrier fighters would be needed. Thus an operational concept would have to be developed that included the initial carrier positioning and fighter-stationing schemes to support the patrol planes. The point here is that in this case fleet defense was an operational-level matter, requiring planning and oversight by an operational-level staff. Fleet defense, be it tactical or operational, is always a prelude to and facilitator of naval offensive operations.

Of course, Aegis cruisers and destroyers are arrayed around a carrier to conduct hit-to-kill defense. They are very capable, but modern antiship missiles are getting harder to intercept, and magazine sizes are fixed. Tactical soft kill in the form of chaff and jamming will play an important role, but from an operational-level perspective, the goal would be to avoid having to fight a tactical defensive battle in the first place. That means, ideally, keeping the carriers unlocated or at least untargeted. Satellites, cyberspace, cell phones, and over-the-horizon radars, on one hand, and the need for the carrier strike group to radiate detectable emissions in order to fight, on the other, make this goal challenging to say the least. In the Cold War, operational deception via maneuver was a tactical matter; U.S. carriers routinely utilized such methods as "sprint and drift" to dodge Soviet satellites to show up unexpectedly somewhere. In today's interconnected world, operational deception, especially for a carrier battle group, will require operational-level planning at the regional and perhaps global levels, leveraging emission control, deceptive emissions, and cyber-based disinformation. Air operations will be fed into this fabric, but their role will not be anything like it was in Cold War practice.

In the future, operational-level fleet defense will be focused on preparing the joint operations area in such a way that the carrier is able to perform the specific mission role required at an acceptable level of risk. Some roles will require more extensive preparation than others. The objectives will be to blind and confuse the enemy and, depending on the situation and rules of engagement, destroy his capability to shoot. Carrier fighters may work in conjunction with submarines and surface "flotilla" forces (about which more below) to do this. In this sense, operational-level fleet defense can be preemptive and offensive. It should be emphasized at this point that such operations, like almost all naval war-fighting operations, will involve the integration of subsurface, surface, and air capabilities—on both sides. This characteristic distinguishes naval warfare from its counterpart over land. As in the Vestfjord example, coordination between land-based and carrier-based aviation will be necessary, as will coordination of both with surface and undersea operations. The JFMCC will be the appropriate authority to make all of this happen.

Operational-level fleet defense also involves preparation of potential battle spaces in peacetime, which is why electronic-warfare aircraft patrol certain areas. It is one thing to gather information, but the idea of battle-space preparation can easily extend to a variety of peacetime operations designed to shape potential-enemy perceptions and expectations such that the fleet is set up to maneuver successfully in either crisis or war.

The logic of operational-level fleet defense extends to amphibious operations. If opposition to a planned assault is possible, it is the mission of carrier aircraft

to prepare the amphibious operations area (AOA) in accordance with the previously discussed provisions of operational-level fleet defense. A key characteristic of amphibious operations is that they break Fleet Rule 3 by tying at least part of the fleet to a geographic point. Very little opposition can be tolerated at force levels below that of the air fleet. The limited sorties available from aviation-capable amphibious ships will be mostly involved with support of troops on the ground; wider security and defense of the AOA will have to be provided by carrier aircraft. This general framework applies to both amphibious operations across the beach and those involving deeper aerial insertion. Special operations, by their nature, cannot accommodate the same kind of area preparation, but at times robust air support must be available to cover extraction if plans go awry.

There is emerging in American naval thought the concept of "flotilla" operations, the use of an array of smaller combatants along with other manned and unmanned forces in a littoral wherein the threat level precludes the presence of high-value units. These forces cannot operate effectively, at least for very long, if subjected to enemy air attack. Thus, in a way similar to the Norwegian Sea airborne-antisubmarine-warfare dilemma of the 1980s that we have discussed, flotilla forces must be provided some degree of air support. This may emanate from carriers or, possibly, from small, movable land-based detachments of Navy or Marine air. This point recalls the original logic of aircraft carrier operations—to provide air superiority over the fleet and protect forward scouts that were spotting the fall of shot in battleship gunnery. The mission will be air superiority—or perhaps the disruption/prevention of enemy air superiority—at a distance.

COMMAND AND CONTROL

In the summer of 1990, before Iraq invaded Kuwait, the USS *Dwight D. Eisenhower* (CVN 69) battle group was sailing placidly through the Mediterranean. Its commander got a message from Sixth Fleet requesting a campaign plan against a certain country. This was simply a professional exercise, and its scenario was supposed to involve only two carrier air wings. After several weeks of effort, the commanding and executive officers of the squadrons in *Eisenhower*'s air wing produced a logistically feasible plan. However, in the process of planning a gap was discovered—that there existed within the CWC structure no command-and-control capability that could direct an extended and progressive air campaign. The existing CWC apparatus was designed for defense of a battle group, not offensive air operations. The air wing could plan and execute one-time strikes, but it could not monitor or assess progress over time or exert real-time control. This gap existed because the Navy had not conducted an air campaign since Vietnam, and even in that war air operations had been conducted on the basis of "route

packages," meaning that naval strike operations had been simply a series of discrete strikes directed by higher authority.

This problem came home to roost two months later when *Eisenhower* moved into the Red Sea in response to the Kuwait invasion. As the Navy dispatched additional carriers to the scene, the Air Force stood up its Air Operations Center and asserted control over all air operations. The Navy was unhappy about this but had no countervailing C2 structure or underpinning theory of naval airpower. As the air-war phase proceeded, Navy battle-group staffs in the Persian Gulf became frustrated that their target nominations to the AOC, targets chosen to prepare the way (as a matter of operational-level fleet defense) for a putative amphibious assault in Kuwait, were being rejected. They started to nominate primary targets they knew the Air Force–dominated AOC would approve but attached secondary targets that were their real objectives. After launch, Navy aircraft would inform the airborne control cell they were switching to their secondary targets. This need to subvert the targeting process highlights the problem—the naval aviation staffs instinctively focused on supporting the Marines (not knowing, of course, that the landing was a feint), but there was nothing in Navy theory or doctrine to support an argument for their priorities.

Today, Navy operational C2 is shifting to the Joint Force Maritime Component Commander with Maritime Operations Center structure, the better to coordinate with, but also compete with, the Air Force AOC. Thus far, the Navy has focused on the mechanics of MOC operations and has not yet developed a theory equivalent to that governing U.S. Air Force airpower. The issue will come to a head in the Pacific, where the Air Force has a theater JFACC (Joint Force Air Component Commander) / AOC. Because its theory states that airpower must be under centralized command, the Air Force has contended that the maritime domain does not include the air over the water. The matter has been settled in the Navy's favor for now, but it is likely to resurface in the future. Even if the Navy establishes a theater JFMCC (which it is doing), it is possible that, absent an underpinning theory of naval airpower explaining why naval aviation should be commanded by the JFMCC, the Air Force will subsequently revisit and win the argument and get operational control of naval aviation, at least in the Pacific theater.

What would constitute a theoretical basis for keeping naval aviation under JFMCC control? The first and perhaps most compelling argument emanates from the theory that has been previously described—that naval aircraft are essentially extensions of ship weapons and sensors and are therefore too integrated with the fleet to be regarded as parts of the general pool of airpower. While it is true they have been fed into the JFACC Air Tasking Order (ATO) for certain over-land operations, over water the JFMCC is the competent authority, and, unlike ground forces, tactical aircraft are organic to surface units. To appeal to another element

of naval airpower theory that has been discussed, naval embarked tactical aircraft may be controlled by the JFACC only if the carriers are operating in the role of airfields at sea. In the other roles, control of carrier aircraft must be held either by the JFMCC or the battle group commander. This argument reveals the utility of theory.

The other argument against removing the air dimension from the maritime domain is the unity of the fight, as manifested by the Composite Warfare Commander. The threat being composed of subsurface, surface, and air elements, an integrated tactical C2 structure is essential. This logic of three-dimensional interdependence and integration scales up to the regional level, and in this regard the JFMCC rests on the same theoretical basis as the CWC. This dimensional integration trumps airpower theory that says airpower is a unity, must be used economically, and therefore must be controlled by a single headquarters, commanded by an airman. While that claim is true over land if there is an opposing air force, over water the situation it envisions does not exist and the theory must be challenged.

Certainly, the proliferation of intermediate-range ballistic missiles and long-range cruise missiles presents the problem of integrated air-missile defense (IAMD). Defense against missiles is both a regional and local matter. At the theater level, with regard to the allocation of scarce ballistic-missile-defense assets and engagement of longer-range missiles, the theater AOC is the competent authority. However, IAMD is not the same thing as a fight for theater air superiority; rather it is more on the order of an artillery duel. Unlike a theater air campaign, the IAMD fight will have local manifestations that must be controlled by local commanders, and in these cases IAMD becomes part of the integrated naval battle.

The theory of naval-aviation C2 is a function of the integrated nature of the subsurface, surface, and air naval-warfare environment and the doctrinal roles of aircraft carriers. We can see that the CWC structure, while sufficient for battle group defense and local sea control, lacks the capability to oversee extended operations or campaigns at the operational level. The JFMCC is the headquarters where this function must reside. Naval engagements, operations, and campaigns do not unroll smoothly or progressively over time the way such things tend to do on and over land. Therefore, the ATO approach to controlling air operations is unsuitable for naval operations; it is insufficiently responsive to emergent conditions. Local conditions will govern how many and what kinds of sorties individual carriers can launch. A real-time regional picture will allow the JFMCC to direct mission orders to carriers such that coordination with submarines and other elements of fleet operations is achieved. External U.S. Air Force assets are best handled through tactical control by the JFMCC.

To this point we have essentially drawn a picture of the theater of operations in which there are two principal "bubbles" of air—that over land, controlled by the Air Force JFACC, and that over water, controlled by the Navy JFMCC. Superimposed on both is the functional matter of IAMD, which in some aspects is controlled even over water by the JFACC. However, the seam between JFMCC and JFACC air bubbles deserves some scrutiny. This seam is the littoral. The Department of Defense defines the littoral as comprising "two segments of operational environment: 1. Seaward: the area from the open ocean to the shore, which must be controlled to support operations ashore. 2. Landward: the area inland from the shore that can be supported and defended directly from the sea."[8] This definition implies that in certain circumstances the JFACC can control airpower operating over water and that, conversely, in certain cases the JFMCC can control airpower over land. This is hazy enough to imply some grounds, at least, for U.S. Air Force contentions that—because, by extension, all naval operations are ultimately intended to support operations ashore—the air domain should include all air over the ocean. Here, the theory of the integrated fight can help, to the extent that amphibious operations are involved. If the Marines are operating as a single-service unit and there is no established Army Joint Force Land Component Commander—say, during disaster relief, noncombatant evacuation operations, etc.—then an integrated maritime operation is under way and the JFMCC should have control of associated air support. This kind of air support can go very deep inland indeed, as the initial U.S. Navy and Marine Corps operations in Afghanistan illustrated.

A final argument against JFACC control of naval aviation is that of competence to control. Just as Air Force doctrine asserts that an airman must be in charge of the theater air fight, the same logic suggests that a sailor be in command of the naval fight. This was manifested when in World War II the Navy formed the Seventh Fleet under Admiral Thomas C. Kinkaid to fight under General Douglas MacArthur but kept the fast carriers always under Pacific Fleet command. The fear was that General MacArthur and his staff would subject them to inappropriate risk at inappropriate times. A more modern case occurred in DESERT STORM of 1990–91. *Eisenhower,* which had been deployed since early spring of 1990, was one of the first two carriers on scene in August after Iraq invaded Kuwait. As more carriers showed up in the theater, *Eisenhower* was sent back to the United States to refit. Apparently, General Norman Schwarzkopf, commander of U.S. Central Command, was unaware of this, and when he learned of it—when *Eisenhower* was two days out of Norfolk—he exploded, saying every unit should be in the fight until the end. This reflected a lack of understanding about the nature of U.S. naval power in that era. The carrier could not stay at sea indefinitely, because of maintenance requirements and personnel tempo. After

the war, when the Army and Air Force redeployed to the continental United States, the Navy would have to have carriers available to replace those that had fought the war, as a continued U.S. naval presence in those waters would be necessary.

There is no independent theory of victory associated with the theory of naval airpower. It is always a contingent means to a contingent end. The theory of naval airpower is also necessarily linked to a larger naval theory that involves command of the sea, sea control, power projection, and maritime security. The larger naval theory is operative in both peace and war and is therefore linked to national grand strategy. In naval airpower theory, there are no a priori claims of effectiveness—only guidelines for managing risk and insights linking the nature of the operational environment with command-and-control arrangements. Accordingly, it is more practical and flexible than traditional airpower theory and presents fewer impediments to joint coordination.

It is well known that naval officers have a cultural aversion to theory and doctrine, at least at the operational level. However, the increasing ranges of weapons and sensors have driven the Navy to adopt a regional approach to command and control, in the form of JFMCC/MOC. As this construct overlaps the equally regional JFACC/AOC construct, theory and doctrine are needed to establish the case for naval war-fighting imperatives. As has been demonstrated here, this need can be met without rigid rules or a priori assertions. The fundamental characteristic of naval aviation is its flexibility, so its theory and doctrine must follow suit.

NOTES

This is the eleventh article I have published in the *Naval War College Review,* and it is perhaps fitting, as I end my tenure at the Naval War College, that it deals with naval aviation. I joined the Navy to fly, and as I matured professionally over the years I became less concerned with how to fly and more concerned with why to fly. In a sense, this article is a bit of a capstone on that thinking. I have been blessed to have had the opportunity to serve the Navy and the nation as a faculty member of the College; otherwise, I doubt that I would have been able to pursue any such thought process. I am most grateful for the array of colleagues here who have mentored me, argued with me, and, most graciously and professionally, pointed out errors in my logic. Compliments do not improve one's thinking. Special thanks go to Dr. Cary Lord and his predecessors since 1995 (the year of my first article in these pages) and Mr. Pel Boyer for their unfailing patience and support as I attempted to collect, organize, and articulate my thoughts.

1. This is perhaps an overly simplistic articulation of a naval warfare dynamic that is in fact complex. Alfred Thayer Mahan advocated strategic concentration of the U.S. fleet. Sir Julian Corbett spent considerable space in his 1911 *Some Principles of Maritime Strategy* specifying caveats regarding when and where concentration would be appropriate and explaining that naval concentration included—in fact, demanded—a certain amount of dispersal. Professor Wayne Hughes at the

U.S. Naval Postgraduate School suggests that the best way to characterize the rule is to "find the best way to fight in mutual support. If there is an opposing fleet, this fleet is your objective and a coordinated long range strike is the means"; Wayne P. Hughes, Jr., *Fleet Tactics and Coastal Combat* (Annapolis, Md.: Naval Institute Press, 2000), chap. 4, esp. pp. 94–95. Hughes discusses the matter in generally tactical terms (which can have strategic implications when capital ships are involved), but there are additional permutations at the operational and strategic levels. This is all grist for a separate article or book. For the purposes of this discussion, the author has elected to go with the simplistic characterization.

2. See my "The Future of Aircraft Carriers," *Naval War College Review* 64, no. 4 (Autumn 2011), pp. 13–27.
3. In this sense the carriers *exercise* command of the sea. For an explanation and analysis of this concept see George Modelski and William Thompson, *Seapower in Global Politics 1494–1993* (Seattle: Univ. of Washington Press, 1988), pp. 16–17.
4. For a good discussion of this event see Lyle Goldstein and Yuri Zhukov, "A Tale of Two Fleets: A Russian Perspective on the 1973 Naval Standoff in the Mediterranean," *Naval War College Review* 57, no. 2 (Spring 2004), pp. 27–63.
5. For a Japanese view, arguing that such ships are *not* aircraft carriers, see Yoji Koda, "A New Carrier Race? Strategy, Force Planning, and JS *Hyuga,*" *Naval War College Review* 64, no. 3 (Summer 2011), pp. 31–60.
6. This section is based on discussions by the author with Russian naval officers and on personal experience during his tours as executive and commanding officer of Strike Fighter Squadron 131.
7. For a good description of the context and logic of vector logic, see Mark N. Clemente, "'Who's Got the Grease Pencil?!': What Cyber Security Can Learn from the Outer Air Battle" (paper submitted to the 15th International Command and Control Research and Technology Symposium, June 2010), available at www.dodccrp.org/.
8. U.S. Defense Dept., *DOD Dictionary of Military and Associated Terms,* Joint Publication 1-02 (Washington, D.C.: Joint Staff, as amended through 15 December 2013), available at www.dtic.mil/, citing U.S. Defense Dept., *Joint Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace,* Joint Publication 2-01.3 (Washington, D.C.: Joint Staff, 24 May 2000).

THE LITTORAL ARENA

A Word of Caution

Rear Admiral Yedidia "Didi" Ya'ari, Israel Navy

The shift of naval focus toward the littoral arena that has resulted from the dramatic changes in the geostrategic environment reflects a major rethinking of the role and objectives of sea power in the foreseeable future.[1] Clearly these fundamental changes will result in an adjustment of the relative weight of "green water" and "brown water" missions on one hand and the high seas, which have been dominant in naval strategic thinking throughout this century, on the other. This article raises the question, however, of whether the process of transformation is taking fully into account the scope of the adjustment, particularly the implications it has for prevailing concepts of ship design.

If it is not, it should. The movement into the littoral is much more than a mere change of mission. The constraints in that "ballpark" are quite different from the ones that shaped the development of most current naval force structures. In particular, the level of threat against surface ships—which has become significantly higher in general because of a number of developments of recent decades—has become especially high in the littoral.

This article isolates the case of the surface ship in that arena. It does so at the risk of apparent oversimplification; the factor of air support, for example, is deliberately set aside and barely touched

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upon. The intention, however, is to preclude any presupposition of synergism. I argue that when warships designed for the high seas enter the confined waters of the littoral arena, the fundamental relationships of maneuverability and firepower are upset, and the very notion of synergism comes into question.

If the ships we intend to deploy there are to be sufficiently survivable, we must revisit all our assumptions, starting with the most basic ones. Such a review yields some very interesting insights.

THE LITTORAL ARENA

Compared to the open ocean, the littoral is peculiar in a number of ways, most of which result from its geographical characteristics. The spatial nature of this arena's waters—relatively narrow, often very shallow and confined by the shoreline—dictates constraints on the employment of ships, sometimes so severe that certain types of vessels cannot be used in a given area. The limitations on the use of submarines inside the Persian Gulf is one example. Since by definition the rationale for staying in these confined waters is to exert influence over the coast and perhaps its immediate environs, most missions, to be quickly effective, require a constant and visible presence close to the shore.

The shore, however, is not a passive entity. In fact, in this regime the opponent on land enjoys quite significant advantages. One of them is the modern coastal defense system, comprising radar, electronic surveillance (known as "electronic support measures," ESM), antisurface missiles, high-speed surface combatants, and aviation. These defenses, constituting in effect a land-based fleet, are a new phenomenon; their strength matches, in principle, that of their opponents offshore without sharing the latter's inherent vulnerability. Further, the short distances within the littoral arena create for warships acute problems of reaction time and "threat bearing." That is, at any given moment the ship is deep inside at least one of several coastal weapon "envelopes." At the same time, the small size of the battle space enables the defender on the coast to coordinate and concert his various options—missiles, mines, special forces, and gunnery. INS *Eylat,* sunk in October 1967 by Egyptian Styx surface-to-surface missiles (SSMs) launched practically from within the harbor of Port Said, offers a perfect example of the relative advantage the defender holds in these circumstances. USS *Stark*, hit by an Iraqi Exocet in the Persian Gulf in 1987, is another. As for mines, Desert Storm provided a fresh reminder of how effective that measure can be, both in direct damage and in deterrence.[2]

The question, then, is not only of the *intensity* of the threat; in the littoral the threat is also peculiar in its *density*. Coastal defenses have the ability, simply by tracking the patrolling ship by radars and passive ESM, to target it without giving away any warning. The coastal defender's wide range of options and his freedom

to initiate a strike practically any time he chooses to do so create a threat that is both continuous and immediate. In turn, an attack that could come at any moment, around the clock, forces the ship to maintain a constant, all-dimensional state of alert, one much in excess of that required in any other operational environment. The closest equivalents that come to mind are from the Second World War—the Battle of the Atlantic, with its intense submarine threat, and the Okinawa campaign, with its kamikazes—and they were far less unremitting and less demanding of resources in their need for quick reaction and variety of means.

Moreover, unlike these cases, because perimeter defense has limited effectiveness in the littoral (as will be discussed), more is hardly better. Another factor is the "bystander" problem that is so typical of low-intensity conflicts in the littoral. Civilian tankers, freighters, fishing boats, and aircraft going about their daily business constantly clutter the situation. They make identification harder and more time-consuming, add more uncertainties to the process of building the tactical "picture," and impose constraints upon rapid engagement of suspected targets.

The overall result is a degradation of crews, equipment, and readiness that makes the ship particularly vulnerable. One of the major difficulties reported by units sweeping and hunting for mines in the Gulf war was a continuous and prolonged regime of battle stations.[3] Even more important is the effect that the littoral's special circumstances have on the commanding officer's decision making. The ship's lack of reaction time and the opponent's variety of options dramatically narrow the commanding officer's practical courses of action. USS *Vincennes* (CG 49), in mistakenly downing an Iranian Airbus over the Strait of Hormuz in July 1988, offers a prime example of this effect. The commanding officer—having too much data with too many ambiguities to evaluate in the little time in which he had to react, and probably having in mind the hit that USS *Stark* had received a year earlier in the same waters and similar circumstances—had no real option but to shoot at the incoming contact.[4]

Yet none of these general characteristics is necessarily new or even unique. Some singular properties aside, most points on the list of the littoral's difficulties can to a certain extent be attributed to other naval environments as well; and one might argue that the differences are a matter of degree rather than essence. Moreover, most maritime engagements fought since the end of World War II have been fought near to shore. The littoral *is already* where things are happening, and has been for quite a long time now.

Is there, then, cause for alarm? Has the vulnerability of surface forces deployed in the littoral risen so sharply that the lessons of at least a half-century of operational experience must now be revised? If so, how?

THE MANEUVERABILITY PROBLEM

Two major factors are at the core of the new realities in the littoral. The first is the dramatic increase in the ranges at which targets can be located—that is, in the size of search and detection envelopes. A navy's starting point in day-to-day operations is the spatial expanse within which it knows with immediacy, in "real time," the exact state of affairs. That expanse today is larger by an order of magnitude than it was for navies in World War II. The tactical picture available to the German defenses at Normandy, for instance, is an illuminating example; the surprise achieved on D-Day would have been impossible in the presence of a single, and quite simple, modern coastal defense radar, detecting the assembly of the huge landing fleet on the British side of the Channel.

The second factor is the entrance of the guided, or homing, missile into the maritime battlefield. World War II was essentially a gun battle, whether the guns were on the ground, seaborne, or airborne. Torpedoes and bombs, though heavier in explosive capacity, were essentially just slower bullets. The maneuverability in combat of a fleet or single ship, therefore, was a crucial element in every dimension of battle. The right maneuver would deceive enemy aircraft, lead them to miss their targets, or, often, contribute to their being shot down. Submarines were compelled to abandon attacks and run for safety or be chased and trapped by the much faster antisubmarine escorts. On the surface, maneuvering was the key to reducing the enemy's hit probability and enhancing one's own. The entrance of the homing missile totally changed things.

The surface ship is confronted now with a universal "smart" weapon, one that is so much faster and more agile than the ship—at least twenty or thirty times—that it is virtually unaffected by the ship's movements. The missile has practically annulled the surface ship's maneuverability.

Unlike the air battle, in which the aircraft (itself subject to continuous improvement) has until very recently maintained reasonable platform-to-threat speed and maneuverability ratios, the surface ship has remained essentially the same in these respects for the last fifty years. Thus, compare a Mustang or Spitfire of the 1940s to an F-15 or F-16. Then take a Second World War destroyer or frigate and compare its speed and maneuverability to what similar types offer today; they were no worse then, perhaps better. Oddly enough, this remarkable freeze in performance has never been made an issue. Throughout the last half of this century, the underpinning assumption has been that through the synergistic effect of combining several types of ships, with the capabilities of one compensating for the deficiencies of others, a balanced and survivable force could be created. The expanse of the open ocean, in which the main exemplar of this concept, the aircraft carrier battle group, would operate, and the maneuverability of its air assets, would offset the depreciated maneuverability of its surface ships. The battle

group could establish surveillance and defensive barriers at great distances; its ships accordingly would have time to establish their tactical plots and calculate responses to possible threats. The ships' loss of maneuverability was not on the agenda of force planners because it was masked by the idea of "defense in depth."

Even before the focus shifted from the open-ocean battle group to the expeditionary force in the littoral, however, a great deal of that compensating effect had been lost. An array of tactical and theater SSMs and ASMs [air-to-surface missiles] had created what is in many situations essentially a one-on-one confrontation between the incoming missile and the ship in which no synergism can significantly offset the disadvantage of the latter.

Where missiles are concerned, the contest between the offense and defense is marked by a serious differential in starting points. In practical terms, the offense has a huge and nearly motionless target to hit and needs to hit it only once. One large missile warhead is equivalent to something like five or ten direct hits by a sixteen-inch gun.[5] The defense, on the other hand, is required to intercept an extremely fast and quite agile flying object, sometimes hardly detectable in the various phases of its trajectory, which can be launched from any operational dimension and often—for design purposes, *every time*—completely by surprise. The defense must deal with a weapon that can perform deceptive terminal maneuvers intended to outmaneuver hard-kill means (those attempting actually to destroy the missile); with a weapon equipped with any, or a combination, of a variety of guidance systems and homing devices designed to outperform a ship's "soft-kill" protective measures (which attempt, actively or passively, to cause the missile to miss); with a weapon that can be launched in salvos on multiple approach paths to saturate countermeasures of whatever kind.

Above all, the defense must constantly perform without error and without defect in an electronic environment so densely charged and a tactical situation so cluttered that they cannot be fully simulated. Uncertainties regarding the actual performance of defensive suites in a full-blown modern engagement are a cause for concern. Even limited experience has established, however, that whereas for the offense a mistake or malfunction means the loss of a missile, for the defense it means at least the disablement, and probably the loss, of a ship.

To be sure, defenses have certainly come a long way since the sinking of INS *Eylat* in 1967. Only six years later, during the Yom Kippur War, Israeli missile boats were able to survive more than fifty attacks by SS-N-2s without being hit even once. With the subsequent introduction of hard-kill systems—both guns and antimissile missiles—the defense has generated a very impressive set of capabilities. But so has the offense. The new generation of antiship missiles is very far from the primitive SS-N-2 of the 1960s. The Exocet Block II, for instance, is almost immune to current soft-kill means and poses a highly challenging

interception and destruction problem.[6] The Russian SS-N-22 "Muskit" (or "Sunburn," as Nato knows it) is an operational Mach 2–plus sea-skimmer with a quirky (and at present incompletely known) maneuver in its terminal phase that can probably penetrate any existing defense system, hard or soft-kill, especially when launched in salvos.[7] Optical guidance and laser beam–riding missiles require a whole new family of defenses for soft kill, which are only now emerging as prototypes, some ten years behind the threat they are designed to counter.

This gap is no accident. The difference in magnitude of the design problems and the fact that the defense is essentially reacting to innovations by the offense mean that the defense has no option but to make do with generic solutions. To produce a tailor-made response to a specific threat, that threat must itself be fully developed and real, and then be thoroughly studied, with all the typical intelligence uncertainties resolved—only *then* can design and testing get under way. Almost by definition, therefore, the defense lags behind. Moreover, as a practical matter, for each upgrade of its systems the defense must refit all affected vessels, whereas the offense has a much simpler task of implementation, sometimes the mere changing of missiles in the canisters. The gap in real life, then, is even larger than in theory. In the littoral the disparity between offense and defense is further amplified, to the great disadvantage of the ship. The constraints upon coastal defense are much less critical in terms of vulnerability than are similar constraints on the surface ship. The defender ashore has more redundancy; he can easily replace, resupply, and reinforce his assets—and his "platform" cannot sink. By contrast, to offset the fundamental imbalance of risk, the ship's capabilities must be pushed to their uttermost limits.

Take once again the example of the SS-N-22. In a coastal configuration, the missile, cruising at a speed of 720–740 meters per second, covers the distance of, say, fifteen miles to an offshore target in something like forty seconds.[8] Assuming that the ship is constantly tracked by coastal radar or ESM, targeting—that is, precise locating and aiming—can be done internally, without any emission detectable by the ship's sensors. The combatant, therefore, if it is to react effectively while the weapon is still a safe distance away, must be ready not only to detect it the instant it is launched but to have every countermeasure operating within the *first thirty seconds*. Setting aside the first five or ten seconds for resolving ambiguity in identification (due mainly to the missile's sea-skimming flight), the reaction time is reduced to some twenty seconds. Such a defensive posture must be maintained constantly, as long as the ship is within search and weapon range from the coast—and in the littoral, it practically always is.

This state of affairs is reason enough, in my view, for a major reevaluation of the most basic concepts of force structure and ship design, at least as far as the littoral is concerned. The scenario above is an extreme one, yet it is reasonable

for a number of likely future theaters, the Middle East and the China seas in particular. It is a level of threat we cannot afford to accept, and should not, even if ships' defenses had better probabilities of kill than they do. The problem lies in the simple fact that the surface ship is a constant target in the littoral. The surface ships now in commission were designed with the open ocean and distant defensive perimeters in mind; to keep deploying them to a playing field where, under the most optimistic assumptions, their survival requires as a normal operating mode the highest level of *everything, all the time,* is unhealthy and unrealistic in the long run.

ALTERNATIVE MANEUVERABILITY

Though the decline in maneuverability as such has hardly been addressed in the naval community, the increase in vulnerability has been too obvious to miss, and quite serious efforts have been made in the last few years to meet it. The major direction of these efforts—apart from improvements to active electronic countermeasures, or ECM, and to the firepower and interception probabilities of hard-kill systems—has been in signature management. The idea is to reduce the vessel's "visibility" to enemy radar, thermal, and noise sensors in order to shorten the range at which they can detect the ship and make it easier for ECM suites to prevent an incoming weapon from locking on. So far, it appears, the results have been both too little and too late. The multitude of homing methods already available—specifically dual-mode guidance and target-verification technology—creates continual tradeoffs and contradictions for the defense that make matters, in both design and practice, highly problematic.

For instance, against radars, "stealthy" design conflicts with sensor and weapon system installation; that is, the very existence of antennas and topside launchers makes the vessel, however stealthy otherwise, more detectable.[9] The ship's own sensors, needed for its defense, are also the largest contributors to its radar cross-section (RCS). Thus the costly and difficult reduction of the ship's RCS is practically annulled by the use of radars to detect and track an incoming missile—at the very moment when that reduction is needed the most.

The same is true for thermal signature reduction, where a great deal is lost when the first barrage of chaff is fired and the canisters on the deck and superstructure become hot. As a matter of fact, any thermal-signature reduction will be worthless when the guns or missiles are used, and that, in the littoral, is common. USS *Vincennes* was chasing and shooting at Iranian fast attack boats just before the ill fated airliner appeared on its radars. Suppose the contact had actually been what the cruiser thought it was, or worse, an Iranian ASM? The ship would have had to counter it with no hope of lowering its thermal profile.

Dual-mode guidance, for example, is specifically designed to take advantage of such conflicts, capitalizing upon the defense's efforts to deal with one prong of its dilemma at the expense of the other. A salvo of two or more missiles with different homing systems creates in essence the same effect. Combinations of active and passive radar seekers, infrared (IR) and IR imaging, and antiradiation and optical guidance are in various phases of development around the world, and the multi-type salvo was in the Soviet missile doctrine for decades.[10]

The advantage the offense has here is a substantial one. The measures the ship takes to counter one type of threat are used by the missile's secondary guidance system as homing inputs. Thus in every phase of the encounter the ship is exposed to at least one type of guidance or homing device, and in most practical cases in which something other than active radar is involved the crew will operate under significant uncertainty as to what type of homing it faces or will face. Finally, even if these design conflicts are resolved for the defense, the probability of visibility in daylight at close ranges in the littoral will remain. Optical guidance and laser beam–riding can be used by day, and at night there is IR imaging.

It is no wonder, therefore, that more and more resources are being put into the hard-kill approach, into designing guns and missiles to shoot down incoming missiles. The weapons of this type already in use, such as the Sea Sparrow missile, the Rolling Airframe Missile (RAM), and the Goalkeeper close-in gun system, are outstanding achievements of research and development, but because of the fundamental disparities involved, anything the defense can do the offense can do better. The technology for high-velocity interceptors, for instance, is already employed by the *offense*—it is in use today in the SS-N-22 and is being applied to the French-German ANS supersonic surface-to-surface missile now under development. The same can be said of "stealthy" design; "low-observable" threats will require yet another major upgrade for the hard-kill side, and it is an open question whether any nation will be able to afford the costs involved.

Signature management does have its benefits for short-term and specifically defined missions that require surprise and are aimed to create local advantage. A great deal of signature management's effectiveness, however, will be lost in long-term, routine presence in confined waters. By contrast, a coastal defender employing modern systems has all the time he needs to wear out the offshore targets, let them make mistakes, use up their limited magazine capacity, and make themselves more and more vulnerable. A ship's signature makes little difference to him.

If signature management does not take us far enough, what else is left to rebalance the situation in the littoral? We could certainly consider the costly and protracted process of developing a new generation of defensive suites. But this

equipment would be installed on decks and masts that are already crammed, and as we have seen, it is likely to be out of date on arrival. Given the fundamental offensive advantage in this contest, the best we can expect is to freeze the current situation, hardly to achieve a substantial improvement. Again, and with the existing fleet, we can *outsmart* the coast in the short run, capitalizing on the deficiencies of specific coastal defense systems. We can use massive ECM to neutralize their search and detection capabilities, for example, or sometimes simply destroy them altogether—and so on. But these are isolated cases; they might become rarer, and violently "outsmarting" them will not be so simple in the future. Political constraints and the proliferation of sophisticated weapon systems and technologies can combine to create situations in which such options might not be available. For low-intensity conflict an immediate clash is certainly not the rule; that environment requires a broad and flexible palette of means, some of which are less bold and nonprovocative, others clearly forceful enough to project power. One can certainly carry a big stick with today's surface ships; it is hard to walk softly, harder still to walk safely.

It appears, therefore, that not much can be done to change this state of affairs fundamentally unless we are willing to consider bold conceptual steps to regain maneuverability in the littoral. We must start to focus upon how we can adjust the surface fleet to these specific circumstances. Thinking in terms of the 2000s, the current exposure of surface forces must be addressed from much broader perspectives than it has been. These perspectives, however, require us to question one of the most basic tenets of naval philosophy in this century—the division between surface and subsurface.

BIDIMENSIONAL MANEUVERABILITY

Submarines are essentially immune to most of the threats that surface ships face, in particular to current SSMs and ASMs. It is interesting how different the evolution of the submerged platform has been from the direction taken on the surface. Two elementary differences are very illuminating:

- Submarine design has focused primarily on optimizing the hull to increase speed, the essential part of maneuverability in the general sense. Indeed, since World War II, performance in these respects has advanced remarkably in the case of nuclear propulsion, and conventional boats have also improved dramatically. While the surface fleet, at least for littoral operations, has lost entirely its effective maneuverability and has been forced to rely solely on firepower and electronic warfare to survive, submarines have developed their maneuverability to the ultimate level, counting on it—quietness being another component of their maneuverability—almost exclusively.

- While the surface fleet has become, and has accepted being, a constant target, submarines have allowed themselves to be targets hardly at all, and ever more rarely. Surface warfare has become an extreme case of dependence upon firepower, electronic countermeasures, and split-second reaction. The submersible, on the contrary, has developed into an untraceable platform that uses its weapons sparingly, reserving them for either the tactically or strategically optimal moment of kill, dropping back into silence immediately thereafter.

If what the surface fleet has become is an inevitable result of entry into the missile age, for the subsurface side it has been much more a matter of choice and philosophy. Modern trends in submarine development were first and foremost the creation of the Cold War, its bipolar geopolitical structure and its unique strategic circumstances. Submarines have been designed having in mind on one hand the strategic balance of mutual destruction, and on the other their ability to avoid and outmaneuver surface and airborne antisubmarine, or ASW, forces. Refraining from using firepower to confront the adversary's ASW assets—allowing him the option of a practically unhindered hunt—was essentially a choice based on that philosophy. Now that fundamental elements and assumptions of these Cold War realities are no longer relevant, however, anomalies are beginning to show up.

For example, it is considered perfectly ordinary for a P-3 maritime patrol aircraft, or a small ASW helicopter, to drive more than a billion dollars' worth of war machine into hiding, deep down, for hours. Looked at from a viewpoint innocent of the circularities of the Cold War's strategic sophistication, this is a striking absurdity. Even more astonishing is the complete difference in scales of risk and of operational standards that the two dimensions of naval warfare have come to accept. On the surface in the littoral, certainty that we are visible to the enemy is an unquestioned and inherent property of everyday operational reality; by submarine standards, the mere *possibility* of having been detected calls for immediate emergency procedures. For a surface ship, being detected means, in the worst case, the opening of a fight; for the submarine, it is an imperative to break off contact and hide.

These conventions, which are remnants from farther back than the Cold War, in fact from World War II, are so deeply rooted in our conceptual framework that we never stop to think about how valid they still are. Desert Storm was the first instance of submarine firepower being used against the land as an integral part of a campaign; all was done, however, as if the whole former Soviet ASW fleet were hovering above. Why cannot a platform that is in essence a submerged missile launcher—tactical, theater, or strategic—be fitted with additional antiaircraft means and play a more active role on the congested surface of the littoral? The

farther we get from World War II and the Cold War conventions, and the closer the littoral realities become, this question gains more and more relevance.

On one hand there is the surface fleet, pushing itself to the limit in confronting a level of threat that renders nugatory the very notion of calculated response. Commanding officers who operate under constraints of reaction time and vulnerability that force total dependence upon automation find that their control over their ships' reactions is diminished and that they are continually uncertain of the quality and adequacy of its defensive performance. Such a state of affairs essentially forces them to make the convulsive and hysterical the norm. Captain Will Rogers of the *Vincennes* and his innocent victims could have been luckier, perhaps, but he had an impossible decision to make. Overloaded with data he had no time to check, and lacking the option of maneuver-and-see, he did what the captains of HMS *Sheffield* (in the Falklands-Malvinas War) and USS *Stark* should have done—and "when in doubt, push all the buttons" was the only valid lesson one could draw from their tragedies. Indeed, what other choices are there for a surface ship in the littoral?[11]

On the other hand, submarines' inherent qualities make them essentially unaffected by the above constraints. Save for depth limitations, they can operate there remarkably more safely than surface ships can—and right here lies the focal point of the opportunity.

By simply making a *choice* to design submarines to confront ASW with firepower rather than improving their capability to hide from it, we can gain a whole new range of options for the littoral. Once this design choice is made, water depth, for example, is no longer a limitation—this new submerged ship has no particular need for it. On the contrary, its optimal operating niche is just below the surface, with sensors just above it and weapon systems ready to engage ASW patrols, air or seaborne. In this position, nearly hidden by the coastal radar's seaclutter, it has the best signature management a surface combatant can ever hope to get. Too small in RCS for most missiles' seeker to lock onto, it also enjoys in effect the best ECM possible. In fact, with the option to dive once an incoming missile is detected, the submersible is, in general, indifferent to the current missile threat altogether. Submarines, confined until Desert Storm to minelaying, reconnaissance, and other "World War III" missions, have a tremendous potential for the littoral—once this mental change is made—and could make a major difference there. Used *bidimensionally,* their unique maneuverability can reduce their exposure dramatically while they maintain a constant, effective presence offshore, thus bringing the risk imbalance back to a workable equilibrium.

Bidimensional maneuverability looks like the most fertile and promising direction for closing the gap in this crucial arena. (It also has a great potential for

the high seas, but that is a matter beyond the scope of this discussion.) It is possible, without too much difficulty, to merge relevant portions of the firepower of the surface ship with the excellent maneuverability of the submersible to produce a new breed of fighting ships designed for the next century. For some large navies, bidimensional maneuverability would be an avenue for reviving an extremely costly asset that is looking for a post–Cold War mission; for others, it reopens operational options that have ceased to be relevant due to the current state of vulnerability in the littoral. If indeed we are heading toward a century in which the littoral is the primary playing field, few arguments for the current total split between surface and subsurface remain valid. As I hope the foregoing shows, there are quite a few good ones to be made to the contrary.

A NOTE ON AIRPOWER

One key factor of the littoral equation has been kept in the background of this discussion, and that is the role of naval airpower. Command of the high seas has been based, at least since World War II, on seaborne airpower. The aircraft carrier battle group, or CVBG, is surely the ultimate form of maritime might. It dominates the operational environment, and it is the conceptual basis for force-structure and ship-design assumptions—assumptions that affect every navy in the world, including those that have no carriers. However, the CVBG has never been tested against a modern, thoroughly professional, coastal defense system. None of the instances, including Desert Storm, in which this floating airfield with its powerful escort has been put into action since World War II give us a real appreciation of its ability to fight in the littoral. How would a combination of, say, SS-N-22 SSMs and SA-10 antiaircraft batteries on the defender's perimeter affect the carrier's performance? That specific instance might become the actual case, in fact, on the Iranian side of the Persian Gulf in the not too distant future; a determined defender there with such armament would be able to track and intercept air and surface targets within a span of more than a hundred kilometers, thereby simultaneously affecting both the carrier and its aircraft. What might be the cost of defeating such a system?

We are beginning now to face the results of the huge research and development effort first generated in the 1980s, on both sides of the bipolar world, by concepts associated with the Strategic Defense Initiative. SDI's last phase focused intensely upon the concrete problem of intercepting Scud-like ballistic weapons and cruise missiles. A product of that effort, for use against targets either in space or within the atmosphere, was the hypervelocity interceptor; with its introduction the manned aircraft faces, perhaps for the first time, a problem similar to that of the surface combatant operating close offshore. That is, it loses, in practical terms, its maneuverability. The effectiveness of the CVBG in the littoral might be

an early victim of this development—which might, in fact, see the effectiveness of manned air platforms, as a whole, significantly reduced.

With such question marks, it is necessary for the planner to treat the surface problem in isolation. The range of uncertainty in planning for the 2000s requires a clear vision of how things stand with each and every element of the equation, alone, before we get to the business of putting them all together.

TO REGAIN MANEUVERABILITY

An important fact to keep in mind about sea power generally is that it has not been truly tested since World War II. We have for evidence the few clashes of the 1971 Indo-Pakistani War and of the 1973 Arab-Israeli War, both of which essentially involved random missile boat engagements without substantial use of airpower. We have a few instances of maritime aviation in action on a wide range of intensity levels: Vietnam, the Falklands, individual raids on Libya and Lebanon, and the massive coalition operations of Desert Storm. There are quite a number of assault landings, from Korea on, and there are a number of single actions (some of them in the campaigns mentioned) that can stand alone. However, we do not have, to serve as a test case, a single instance of a large-scale maritime battle fought between substantial adversaries employing a full range of modern means. For the surface world, the paradigm is still the historic battles of the forties in the Atlantic and Pacific.

There exists, then, the quite peculiar situation in which nothing can be properly substantiated—neither commonsense-based adherence to the experience and convictions of sea power that we have long had, nor the intuitive feeling that the cumulative change is now of such magnitude that a radical rethinking of these convictions is of crucial importance. Yet the latter is a matter of more than intuition, at least in one sense—we are entering the next century, and also a dramatic transition from the open ocean to the shallow seas, with a severe lack of relevant experience. Too often in military history, at such moments of uncertainty old principles have hardened into beliefs that have been, among other things, the grounds for rejecting new, more adequate ones.[12] We have no option but to rely on an analytical process that subjects every conviction of the past, including the most fundamental ones, to unconditional examination.

The white paper ". . . From the Sea" marks a turning point in a century of world wars—a historic shift from the one-global-conflict model to that of two or more small-scale ones, and from the high seas to the littoral. It would be a mistake to assume that global conflict is no longer a valid scenario; the twenty-first century could be just as problematic in that sense as the present one has been. The capacity to gain control of the open ocean and the choke-points on its periphery is certain to remain a prerequisite of naval strategy.[13] It would be just as erroneous,

however, to ignore the disturbing signs of inadequacy, as regards the littoral arena, in present ship-design philosophy. We have a fundamental problem in the balance of maneuverability and firepower: submarines that use only a small portion of their capability, and surface combatants that operate like the town sheriff of the nineteenth-century American West, walking the street and ignoring the riflemen on the roofs.

We must regain maneuverability if we are to be able to dodge the incoming missile instead of having to destroy or deflect it. We have to cease being a constant target, in order to regain control over the man-machine relationship in threat evaluation and response; we cannot allow to continue the present state of affairs, in which commanding officers must either expose their ships to a fatal hit or shoot at every unidentified contact. With so many new threats in the littoral, it is an open question whether even that gives sufficient protection.

A merger of surface and subsurface capabilities in a bidimensional fighting vessel has the potential to meet these requirements. It can combine the effective properties of each, while losing mostly those which the end of the Cold War and the transition to the littoral have rendered excess. For example, diving depth and silent operation could be traded for more firepower. There is no question of doing away with existing forces, certainly not in the short run. Bidimensionality does, however, imply the beginning of a new planning phase.

We must realize that dividing between surface and subsurface is, after all, a very costly *double* investment. In the littoral, it is also losing its operational rationale; in the Gulf war, for instance, the mission profile of submarines was essentially identical to that of the surface fleet, the carriers aside. This trend can and should be pushed farther, optimizing in favor of firepower options on the surface and trading off some of the more exotic capabilities of the subsurface.

There are no perfect solutions in our trade, but some are better than others. The basic concept of bidimensional maneuverability, with its commonsense rearrangement of existing capabilities in a new package, is in my view among the better and more promising ones. It opens a real avenue for development but is responsive and adaptable to the new realities of the littoral. In any case, we will probably have to make do with less in the 2000s. The next generation of ships is certain to be extremely expensive, whatever direction ship design takes. To continue risking them in an environment in which they do not belong will be even more problematic, politically and militarily, than it already is. Bidimensional maneuverability might be not only the preferable solution for the littoral, but the only one.

NOTES

1. U.S. Navy Dept., ". . . From the Sea: Preparing the Naval Service for the 21st Century," Navy and Marine Corps White Paper (Washington: September 1992), esp. pp. 1–5.
2. The American warships USS *Tripoli* (LPH 10) and USS *Princeton* (CG 59) were each removed as fighting units for the entire Persian Gulf War by one mine. Just how much the random Iraqi mining affected the decision about landing from the sea on the northern flank of the coalition forces is still somewhat a matter of speculation—but it certainly did not help.
3. Captain (now Rear Admiral) Pieter C. Kok, commander of the group that the Royal Netherlands Navy deployed to Desert Storm, discussing lessons of the war in conversation with the author.
4. However, see John Barry and Roger Charles, "Sea of Lies," *Newsweek,* 13 July 1992, pp. 29–39.
5. This figure is based upon a rough estimate of the differences in warhead payloads. The sixteen-inch gun's armor-piercing round carries 18 kg of high explosive, while high-capacity ammunition has some 70 kg. Large Soviet-designed missile payloads begin at 500 kg (for the SS-N-2) and go up to some 1,000 kg (in the SS-N-19 Shipwreck). The SS-N-22 has 340 kg. Even Western missiles carrying payloads in the 200-kg range but employing delayed fusing are considered to double or even treble their effect by exploding inside the ship's hull.
6. The Block II family (the AM-39 and the MM-40 SSM) is reportedly equipped with a digital processing capability immune to current active electronic countermeasures. It offers a reduced radar cross-section during mid-course flight and a sea-skimming terminal phase, adaptable to sea state. Its sophisticated trajectory capabilities include "angular evasions" to deceive medium-range surface-to-air missiles and terminal agility against close-in weapon systems. It also provides a variety of salvo combinations for saturation attack.
7. The SS-N-22 has a range of 100 to 120 kilometers and a sophisticated guidance system. It is operational in a surface-launched version and has been shown in an air-launched version as well.
8. So far the only indications of the existence of such a configuration are brochures with artist's conceptions of the system. In light of 1993 Russian tests of the ASM variant, however, and the rather small modification required to produce a land-based version, we can safely treat a coastal SS-N-22 as a valid option for this analysis. See *Jane's Defence Weekly,* 22 August 1992, and *Aviation Week & Space Technology,* 24 August 1992, p. 64.
9. For a more detailed discussion of the design issues, see John W. McGillvray (Captain, USN), "Stealth Technology in Surface Warships," *Naval War College Review,* Winter 1994, esp. pp. 30–6.
10. Open-source references are scarce. The RAM is the first for which a true dual-mode design has been acknowledged; an upgrade has already been announced. See *Naval Forces,* no. 4, 1994, pp. 48–54. The AGM-119 Penguin Mark 4 and the Otomat 2 programs are also believed to be dual-mode weapons; see *Forecast International/DMS Market Intelligence Report* (Conn.: 1991), Tab E, s.v. "AGM-119," p. 3, and "Otomat," p. 5. The AGM-84 Harpoon home-on-jam option and the SS-N-22's active-passive guidance are designed to achieve essentially the same effect.
11. See Barry and Charles.
12. For examples see Sir John Winthrop Hackett, "Society and the Soldier, 1914–1918," Malham M. Wakin, ed., *War, Morality, and the Military Profession* (Boulder, Colo.: Westview Press, 1986), pp. 86–8.
13. For the views on this subject of the drafters of ". . . From the Sea," see Edward A. Smith (Captain, USN), "What '. . . From the Sea' Didn't Say," *Naval War College Review,* Winter 1995.

A PROPHET FOR OUR TIMES

Wayne P. Hughes, Jr.

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It is appropriate for the *Naval War College Review* to reprint the superb essay by Admiral Ya'ari, because the things he foresaw nearly twenty years ago are all coming to pass—an analytical performance worthy of any Old Testament prophet.

The growing hazards and deadliness of the littoral seas are something all navies must take into account, but particularly the U.S. Navy, because it is only just beginning to grasp the uniqueness of the littoral environment, the need for new tactics, and the value of warships better suited to fight in its clutter. For example, with Professor Don Brutzman of the Naval Postgraduate School, I have reached the conclusion that the goal of "network-centric warfare" (NCW) is appropriate only for operating an aircraft carrier battle group, an expeditionary strike group, or a surface action group, none of which can perform its function without radiating almost continuously. But NCW is ill suited for more numerous, distributable, smaller, and less expensive ships intended to fight in the demanding environment described by Admiral Ya'ari.

A better image for inshore operations is one of "network-optional warfare" (NOW) that supports tactics of stealth and surprise, so we can *attack effectively first*. Such tactics take advantage of the many forms of clutter and concealment. They allow vessels to operate under doctrine that greatly reduces the need to radiate. In the 1973 war at sea, the Syrians found themselves outclassed tactically by the Israeli Sa'ar boats, so their missile ships attempted to hide behind shipping off their own ports. Appropriately, they called the merchant ships "sandbags." NOW is also well suited to exploiting the advent of unmanned and robotic systems for search, deception, and attack.

Although I think Admiral Ya'ari's solution based on greater use of submarines is appropriate, he may have overstated a case that is more appropriate for Israel than the United States. The coast of the eastern Mediterranean has few bays, islands, or inlets. Its terrain and vegetation offer meager concealment, even for the smaller surface combatants. Moreover, the United States depends on its fleet

to protect merchant shipping for trade, as well as amphibious vessels engaged in landing and sustaining ground forces ashore. To date, it takes a *surface* warship to protect a merchant ship from missiles, and the notion of sending large volumes of goods in submersibles has thus far been untenable economically.

In contested waters, and in particular facing Chinese antiaccess/area-denial defenses, the growing land-to-sea threat from Iran, renewed Russian threats in the Baltic and Black Seas, and North Korean threats in the Yellow Sea, submarines are necessary *but not sufficient* for the U.S. Navy. A blend of four strong options to confront an enemy who contests the littoral seas would comprise, first, greater reliance on underwater systems; second, ships that can deny the enemy the use of his own littoral waters through maritime interdiction; third, small Marine outposts many of which can deliver land-to-sea missiles, some being invisible and all being relatively easy to establish and disestablish; and fourth, flotilla ships deployed from the outposts to confront illegal enemy claims on the ocean's surface.

But solutions will come in the U.S. Navy only when the word picture of littoral deadliness painted by Admiral Ya'ari has been grasped. His description of the unique complexity of operations there, the lack of battlefield depth, and the ever more numerous missile types and the many distributable ways of delivering them represents just the beginning of wisdom. Ya'ari emphasizes the remorseless, never-ending, mentally exhausting need for hair-trigger readiness to open fire, and the constant danger of attacking innocent ships or airliners. New tactics and warships, as well as such emerging technologies as robotic systems, will be needed—first, to create a contested no-man's-land in and over enemy waters, and second, to win control of the surface—so that the United States can continue to exploit its maritime advantages where and when needed.

And all at an affordable cost in ships, aircraft, and systems for command, control, surveillance, and intelligence.

REINVENTING THE DRONE, REINVENTING THE NAVY

1919–1939

Angelina Long Callahan

Invention is often perceived as an isolated event, attributable to a momentous "first" or to a single, patent-holding inventor. However, rather than questioning what qualified as the first drone aircraft or to whom the title as its "inventor" belongs, this article maps out the winding uncertainties of technical evolution—exploring how seemingly failed projects laid groundwork for the U.S. Navy's first successful radio-controlled drone aircraft.

Situated as they are among a cluster of interwar emerging technologies, drones provide an instructive case study through which to consider how the U.S. Navy's research-and-development (R&D) communities function as a strategic asset. When the availability of one subcomponent can jeopardize an entire research project, such factors as institutional stability, the circulation of ideas, and willingness to reevaluate naval doctrine become critical to national security. So too does the ability of experts to recognize a (perhaps temporary) dead end when they face one. This article will flesh out, for this case, the actors and activities of innovation, emphasizing how the collaborative nature of this work can mitigate the uncertainties and risks of R&D.

This article is divided into five sections. The first is a case study of invention, recounting the acts of collaboration that were necessary for the development of the first American radio-controlled aircraft. To build this prototype, the electrical engineer Carlos Mirick consulted a variety of research partners, integrating cutting-edge

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instruments and subassemblies from colleagues performing R&D in Navy and industrial laboratories and manufacturing firms.

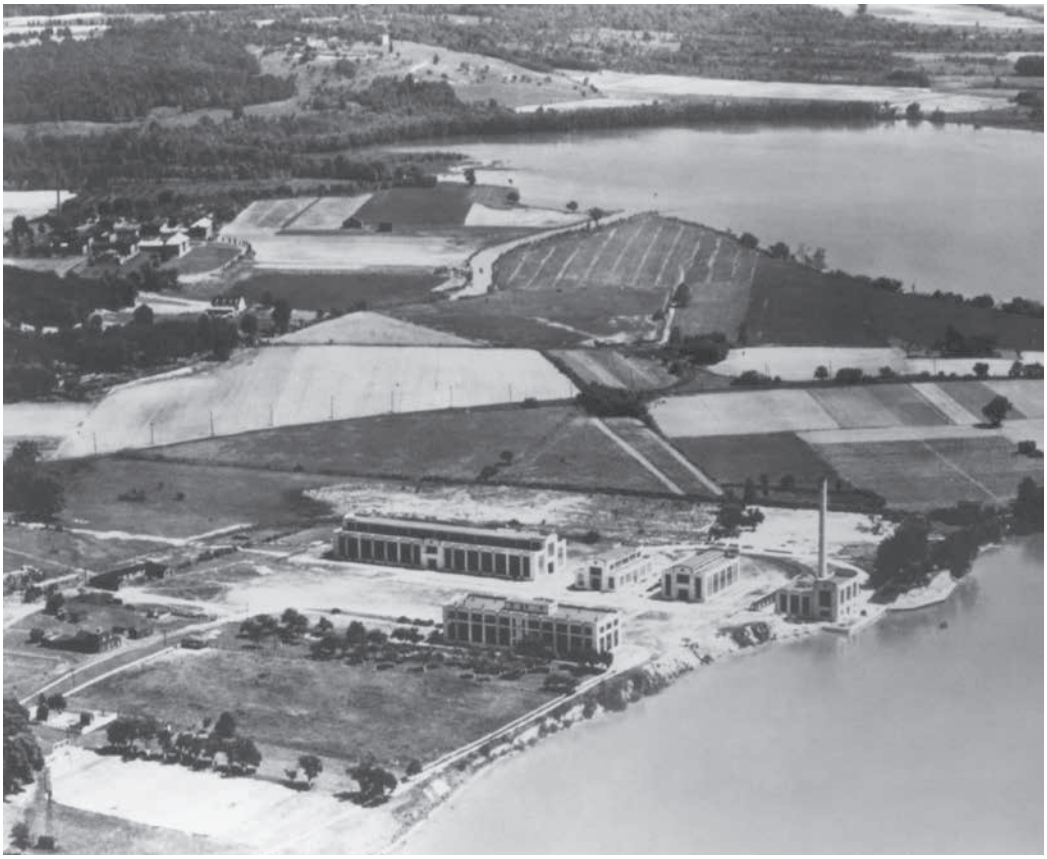
Second, this article describes how Rear Admiral Stanford C. Hooper, often remembered as the "father of naval radio," administered resources and directed research to render the high-frequency (HF) band of the electromagnetic spectrum a much more reliable operating range for radio. Facing interwar budget cuts and losing a substantial number of naval researchers to the private sector, Hooper labored to retain a cadre of resourceful and engaged scientists and engineers in the early 1920s, centering them at the Naval Research Laboratory.

Building on this background, the article's third part shows how the Naval Research Laboratory's broad range of R&D programs and organizational stability provided these projects with institutional continuities and connectivity to a wide range of fleet research problems enabled the resurrection of (useful) elements years after the cancellation of R&D projects. The fourth section describes how elements of "failed" guided-missile projects were transferred to new lines of R&D, yielding previously unanticipated results—bombsights, target-drone battleships, and target-drone aircraft—all of which fostered the meticulous reevaluation of operational and tactical doctrine by the U.S. Navy in the years leading up to the Second World War.[1]

The article closes with reflections on the calls that have been prompted recently by the proliferation of drone technology among potential adversaries and the increasing complexity of battle networks for a more centralized forum to coordinate autonomous-systems research, development, and use.

CASE STUDY IN INVENTION: THE *WILD GOOSE* "FLYING BOMB"

Between the 1890s and World War I, the proponents of radio managed to secure a toehold in the U.S. Navy, owing not only to the utility of the hardware but to the fact that Great Britain and Germany were developing technical and duopolistic leadership in the field of communications.[2] In the United States during this time, the Naval Consulting Board had identified a need for a general research center, but the proposal had for years been mired in debate over how best to characterize the laboratory's work.[3] Would it be an "invention factory," turning out new prototypes for submarines and ships on a monthly basis?[4] Would it engage only in adapting commercial inventions to Navy needs, not producing, therefore, matériel in competition with private industry? The nature of the laboratory's work would influence the logic of its location, another point of contention. After nearly a decade of debate the Naval Research Laboratory (NRL) was founded in the Bellevue neighborhood of Washington, on the Potomac River near the southernmost corner of the District of Columbia. NRL's location near downtown Washington was something of a compromise among proponents of Annapolis, Maryland, and



NRL, preceded by disparate and highly specialized facilities, was the first facility established to serve the research and technical needs of the entire Navy. All photos courtesy NRL

Sandy Hook, New Jersey.[5] It appealed to naval officers like Hooper, who headed the Bureau of Engineering (BUENG) Radio Division and who also oversaw the founding of NRL's Radio Division, because it was conveniently accessible from the Naval District Washington headquarters.[6] It contained for the moment only two divisions, Radio and Sound.

In a sense, the current U.S. unmanned aerial vehicle (UAV) effort can be traced to NRL's Radio Division, which opened with just nineteen engineers and four physicists in the spring of 1923.[7] They had been brought there from BUENG's Radio Test Shop, the Radio Research Laboratory, the Aircraft Radio Laboratory, and the Anacostia Naval Air Station, adjacent to the new site of NRL. Experts and skilled shop workers at the Washington Navy Yard were also transferred to the laboratory, as all navy yards were now to cease pursuing their own dispersed and uncoordinated research problems.[8] Stated Rear Admiral Stanford Hooper, "Our idea is that all research should be concentrated here where we have employed Physicists and Radio Engineers of the highest quality." Significantly, he predicted that through these measures "research along various

lines can be thoroughly co-ordinated."[9] This coordination appealed to the Navy Bureau of Engineering in part because bringing researchers to one centralized facility streamlined an "unwieldy and expensive" collection of post–World War I Navy facilities.[10]

Radio Division researchers reported for duty on 16 April 1923, a full three months before NRL's dedication and formal opening.[11] Over the course of ten days, naval air station experimenters relocated downstream from the Anacostia River to NRL's dock on the Potomac—loading and unloading the barge full of equipment themselves.[12] Setting up shop with "temporary wires strung here and there" and using portable generators for power, experimenters set to work reassembling their tools and lab equipment.[13] One of many experienced and resourceful engineers who had been circulating among communities of mechanicians and was now setting up shop at NRL was Carlos B. Mirick. With a Cornell University degree in electrical engineering, Mirick had served as an engineer in Washington, D.C.'s National Electrical Supply Company until World War I. Following service as a Naval Reserve officer, he returned to the Electrical Supply Company as a vice president of engineering. Soon after, he returned to the Navy and in 1919, the Navy's naval air station loaned Mirick to the Air Mail Service, where he helped develop direction-finder loops for navigation and helped develop the radio direction finder for the famed *NC-4* transatlantic flight.[14] In February 1922, BUENG invited him to begin work on linking radio transmitting stations and remotely piloted aircraft.

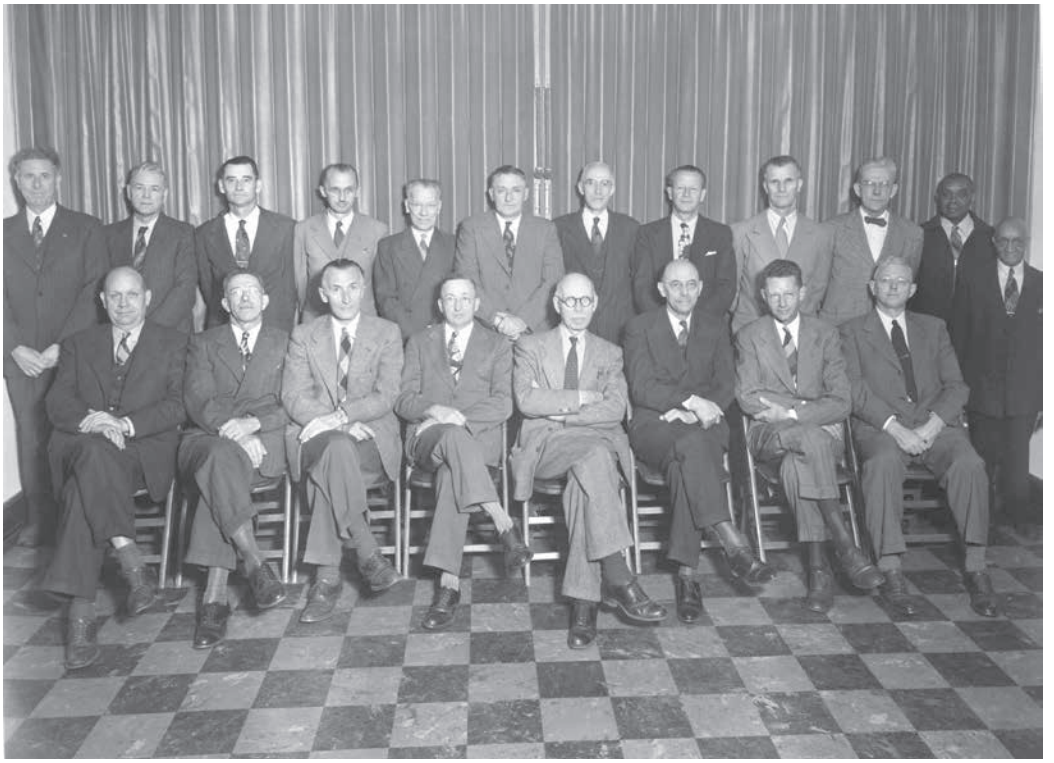
That winter Mirick began construction of what was to be the first American remotely piloted aircraft, intended to be a guided bomb. He set to work in a sheet-iron garage, referred to as the "longwave shack." Lumbering about the unheated shop in a fur-lined flying suit, he experimented with a variety of setups, working toward a transmitter, receiver, and relay capable of controlling an aircraft from as much as twelve miles away. Reflecting back later on his work on BUENG's "flying bomb" project, Mirick would credit several other inventive thinkers for their contributions. In the spring of 1922, he began a tour of military and commercial facilities, surveying various equipment and methods he might incorporate. Among his visits was one to the Hammond Research Laboratory in Cambridge, Massachusetts. John Hays Hammond, Jr., and his colleagues were laboring to develop radio control for torpedoes, having recently demonstrated the efficacy of radio control of ships.

In addition to Hammond, a renowned radio-control expert, Mirick's project materialized in a fascinating confluence of aviation figures and artifacts. The N-9 seaplane Mirick was using dated back to a 1915 flying-torpedo project led by Lawrence Burst Sperry, inventor of the Sperry gyrostabilizer. Sperry's "unpiloted" plane differed from Mirick's primarily in that Sperry's had been supposed

to navigate by preset automation rather than radio control. When Sperry's N-9 had consistently—though narrowly—missed targets, he had requested permission to use radio control to adjust for wind-induced creep. The Naval Consulting Board denied his request, although one historian asserts that postwar aerial torpedo achievements indicate that radio signals would have effectively corrected the flight path.[15] Nevertheless, Sperry's project was canceled. Inspiration for Mirick's ground-control selector switches came through "confidential channels" late in World War I, in the form of indications that German researchers were experimenting with a radio-controlled torpedo boat operated by a modified remote control adapted from wireless telegraph systems. Mirick contracted with an Illinois teletype manufacturer, the Morkrum-Kleinschmidt Company, for the production of two eight-circuit selector switches designed to his specifications. The Kleinschmidt switches were retrofitted into the N-9 by a then-obscure Carl Norden at the U.S. Naval Proving Ground in Dahlgren, Virginia. Through this cooperation the Navy capitalized on Norden's experience as a former partner of Elmer and Lawrence Sperry, with whom he had helped develop the first generation of gyrostabilizers for automated control of aircraft systems. Once Sperry's now-surplus gyrostabilized N-9 and the teletype switches were secured, as Mirick later recalled, modestly describing his own contribution, "the next requirement was to develop a radio link to consist of a receiver and a relay capable of actuating this selector switch while in flight."[16]

The Navy's consolidation of researchers and resources at NRL put Mirick in contact with a number of other experts with overlapping interests in radio. There he completed his bench work on the project, integrating input of scientific researchers, radio engineers, shop workers, contractors, and military specialists. The Radio Division fostered a broad portfolio of investigations, delving into the fields of aircraft direction finding, radio control, communications and radio standards, instrumentation, and the fundamentals of radio-wave propagation.[17]

The photo on the next page shows a few of Mirick's colleagues who frequently consulted with him. These included A. Hoyt Taylor, Louis Gebhard, and Leo C. Young, all of whom had worked together at the Great Lakes Naval Radio Station during the war, where Taylor had taken on the role of supervisor and mentor to Gebhard and Young. Years later, Gebhard would recall that Taylor (as superintendent of the NRL Radio Division) tended to think in broader, more theoretical terms than did his colleagues, who were advancing the field at more technical levels: "We had the ideas of how to do the things that he may not have had. I don't think that he had any great capability of winding a coil or anything like that. . . . But now, he didn't have to do it; he could let other people go ahead and do it."[18] Taylor engaged in radio-propagation experiments on a number of naval ships and in collaboration with amateur radio operators the world over. Through these



Seated (left to right): G. E. Jacobson, W. B. Burgess, R. B. Meyer, L. C. Young, A. H. Taylor, L. A. Gebhard, O. C. Dresser, T. M. Davis.
Standing: E. E. Brock, W. H. Dyer, R. J. Colson, F. W. Struthers, E. L. Powell, D. H. Ness, R. B. Owens, A. E. Meininger, J. J. MacGregor, C. B. Mirick, A. L. Harris, J. W. Johnson.

experiments he labored meticulously to map the ionosphere's effect on HF radio-wave propagation; his early atmospheric and ionospheric studies made important connections with HF radio tinkerers and experts who would contribute to Navy R&D.[19] Over time, Taylor increasingly devoted his energies to administration, helping BUENG translate Navy needs into functional hardware and researchers communicate promising new ideas to their sponsors in the Navy bureaus.[20] In these early days of HF research, Taylor and Young pitched their first proposal for radio detection and ranging—later known by the acronym "radar." (The proposal was unsuccessful. Many years later, Hooper would recall that the bureau turned it down because of problems with vacuum-tube reliability.)[21]

Indeed, NRL radio researchers—pioneers in the use of the more cantankerous radio frequencies of 1,300 kilocycles and higher—made do without a number of instruments that would be ubiquitous by the 1940s. There were no signal generators, and there was no field-strength measuring equipment or means of measuring radio-frequency gain ("except by methods of comparison based on the use of a shunted telephone connected at the receiver output").[22] A colleague working on radio transmitters would recall that though a number of items were ordered from private industry—meters came from the meter company, relays

from relay companies—coils and capacitors were generally made in-house, since they demanded "special design," project by project.[23] In many cases, industrial partners willingly adapted to NRL's demanding specifications. Louis Gebhard, a radio research engineer who had transferred from Marconi Wireless to the Navy in 1917 and was to become associate superintendent of the NRL Radio Division, later recalled the responsiveness of such firms:

> We cooperated with these people and similarly when we got into quartz crystal work, we had to have accurate temperature control. So we worked with a precision instrument company who would provide us with thermostats and thermometers that were high precision. We would work with them: they would bring samples down and put them in and determine how they would work; we would make suggestions as to improvement, to fit into things that we wanted to do for the Navy and quantity production.[24]

The lack of standardized instruments and subcomponents reflects the fact that the laboratory workers were operating on the frontiers of their field, before mass-produced (or for that matter, entirely reliable) parts could be purchased to fill essential needs. Working with industrial partners, NRL researchers labored to improve the reliability of prototypes. This quality-control work, in turn, facilitated the transition to mass production of reliable parts.

NRL's offices and workshops embodied the cutting edge of radio, in microcosm. The Aircraft Radio Group that Mirick headed was complemented by five other Radio Division research groups covering a broad spectrum of activities, from the most basic scientific inquiry to mission-oriented R&D and instrument development. Any of the twenty-three Radio Division personnel could be transferred among the groups—Aircraft Radio under Carlos Mirick, the Transmitter Group under Louis Gebhard, General Research under Leo Young, Direction Finders under Warren B. Burgess, Receivers under Thomas M. Davis, and the Precision Measurement Group under the physicist John M. Miller. In Mirick's opinion, "the best feature" of the radio-control equipment of his N-9, which he dubbed *Wild Goose,* was a much-needed six-stage, choke-coupled radio-frequency amplifier, designed and built under the direction of Dr. Miller.[25] (Miller, also credited with contributing to Mirick's receiver, would spend much of his career developing the piezoelectric crystal hardware and theory necessary to standardize and measure HF radio.)[26]

Mirick later reported, with no hint of embarrassment, that all materials but the vacuum tubes, Miller's amplifier, and the Morkrum telegraph selectors had been salvaged from "old and condemned radio sets."[27] For this purpose he undoubtedly made use of NRL's surplus machinery dump—an agglomeration of some three dozen railroad cars full of surplus radio equipment, tools, cables, wire, and scrap metal. Years later Taylor recalled how "during the lean and hungry days of

the middle and late 'twenties the dump turned out to be a godsend to the Laboratory." In fact, "it was no uncommon sight to see two or three engineers poking around through this pile looking for some usable item." Of course, the dump was not without its problems—in summertime the piles of rusting machinery among sprouting weeds and wildflowers proved hospitable for rattlesnakes.[28]

Establishing an effective radio link between the ground station and the aircraft controls was not just a matter of digging spare parts out of the NRL dump and cobbling them together with Miller's amplifier and contractor-supplied switches. There was the work of actually retrofitting the radio-control system to the seaplane.[29] Beyond that, integrating radio control required careful monitoring of instrument weights, equipment dimensions, and electrical demands. Planes at that time had no power supplies for auxiliary electrical instruments, so Mirick's radio equipment had to include its own.

But how to test a radio-controlled seaplane? Chief Radioman Elmer Luke was assigned to pilot the craft remotely, from its ground station, and Lieutenant John Jennings Ballentine, officer in charge of the proving ground's naval air detail, handled in-flight backup. Between 25 July and 15 September 1924, the collaborators flew the *Wild Goose* a number of times, experimenting with varying degrees of remote control.[30] During these test flights Ballentine, a pilot, rode on board, monitoring specially designed lights to assure himself that radio commands were coming through, prepared to intercede manually if radio communication failed.

In the course of these test flights the team determined that Mirick's radio setup was transmitting and accepting commands adequately but that the system had disconcerting limitations. The Morkrum selector switch functioned to specifications, but, "like a one-armed paper hanger," Mirick worried, "it could do but one thing at a time."[31] It could turn right, turn left, raise the elevator, lower the elevator, throttle on, or throttle off—but only sequentially. The aircraft could not be made, for instance, to turn and bank, or descend and reduce throttle, at the same time. That summer, Mirick decided to make a selector of his own design, one that would permit concurrent commands and operation that more closely resembled piloted flight.

Carlos Mirick knew of a gentleman in Springfield, Ohio, who was working on a relay capable of controlling multiple branch circuits at once. But it proved too large to be adapted to the N-9, and Mirick and Chief Luke set about miniaturizing the system. "Working on similar lines" to the Ohio relay, they mounted tuned steel reeds (not unlike tuning-fork tines) in an old watch-case telephone receiver.[32] The unit's four circuits permitted fewer operations (forward and reverse, right turn and left turn) than the Morkrum switch, but they did make simultaneous commands possible on a wheeled joystick-controlled prototype.

In redesigning the relay, Mirick adapted the interface from switches to an aircraft's control stick the size of a pencil. Before they could test the preliminary system on an aircraft, Mirick and Luke fabricated a battery-powered, three-wheeled cart. Turning again to cannibalized parts, they even pilfered a front wheel from the "velocipede" of Luke's young child Robert.[33] In his September 1923 patent application for an "Electrical Distant-Control System," Mirick explained that since its operation was "identical with the 'joy stick' provided in aircraft for controlling the machine," this new device was "particularly applicable in maneuvering aircraft without a pilot. . . . [A]n operator at the radio transmitter at a shore station who is an experienced aviator may therefore move the lever . . . in the same manner in which he is accustomed to operating the 'joy stick' in aircraft."[34] The joystick controls could not be developed and adapted to the *Wild Goose* in time for its test program; it would have greatly increased the safety of operation for the backup pilot, whose life depended on the craft's (and radio controller's) performance.[35] Several times during the test flights the N-9's control gear malfunctioned, sending the plane into dangerous spins. Given this touchy performance of the *Wild Goose,* each time Ballentine rode as backup operator of the experimental craft he risked becoming one of many Navy pilots and experimenters killed in interwar aviation R&D.

On 15 September 1924, the N-9 flew its first and last truly remotely piloted mission, with only a sandbag (for weight) belted into the pilot's seat. Because Dahlgren personnel had expressed concern that a radio-controlled craft might "get out of control or crack up over land," threatening buildings and personnel, Lieutenant Ballentine devised a safety measure: his assistant aviation officer, Lieutenant J. E. Ostrander, "took off gallantly in a galloping D.H. [de Havilland] land plane," armed with bricks and ready to throw them at the *Wild Goose*'s propellers, thus downing it without using live ammunition.

Overall, the radio equipment performed quite well, except for a couple of moments when the control "seemed to stick." At one point, when the seaplane failed to respond to repeated right-turn commands and lost considerable altitude, the operators cut the throttle and decided to land it on the Potomac. Seeing that it was too late for a safe landing, they opened the throttle again, hoping to make a second attempt. However, the command took effect too late, and the plane's pontoons struck the water with great force. In his report Ballentine stated that the plane rose again approximately fifty feet, then made a satisfactory landing. However, unbeknownst to its operators, one of the aging pontoons had cracked, and it now took on water, causing the plane to sink after an otherwise successful flight. Ballentine speculated that a newer pontoon would have absorbed the shock of the first touchdown, given the fact that the radio-control equipment remained intact. More important, Ballentine and Mirick agreed, what was required

was development of a more refined form of control, such as the joystick.[36] *Wild Goose* having sunk in the Potomac, damaging its electronics beyond repair, it was not until 11 December 1925 that the collaborators could make a second attempt, with new plane and electrical equipment. Unfortunately, the second plane too was lost, when it porpoised excessively on takeoff.[37] Funding for the "flying bomb" stopped that year.

Had it all come to naught?

"HIPPED ON HF": BUENG CULTIVATES COMMUNITIES OF INNOVATION

As illustrated above, Mirick and his colleagues operated on the cusp between the known and unknown. In spite of its yet unpredictable nature, HF radio required the least electrical power, its systems were the lightest, and its antennae the shortest (as was evidenced in those days by the two radio towers, one 430 feet high and one six hundred feet, looming over Arlington Cemetery's low-frequency station for transatlantic communication).[38] Thus, aviation remained one of the critical applications driving researchers to pioneer the high frequencies for communication, navigation, and, for some, radio guidance.

Before and after he secured resources to support the Radio Division at NRL, Stanford Hooper kept abreast of and even publicized Navy experimentation and achievements in HF radio. Information for HF radio inventors, tinkerers, and users circulated in the BUENG Monthly Radio and Sound Report, the *Proceedings of the International Radio Engineers* (IRE), magazines such as *Radio News* (in which the Navy briefly secured a page each month for the service's radio news and pictures), the American Radio League's *QST* (the traditional brevity code for "calling all stations"), and *Popular Radio* (in which Hooper also published).[39]

Indeed, "amateur" implied not so much "not professional" as the use of frequencies deemed too high to be reliable for service use. Today, "high frequency" radio is defined as beginning at three megahertz—or three thousand kilocycles per second (kcs), in the parlance of the 1920s. Mirick's superintendent, Taylor, and his contemporaries, however, considered "high frequencies" as beginning where medium-frequency waves began exhibiting the unpredictability of the ionospheric skip-distance effect—starting between 1,300 and 1,500 kcs. Thus, when Hooper relied on "amateur" radio operators to aid in his experiments, he engaged a broad spectrum of people, ranging from leisure-time ham radio operators to university professors.

The career of Hoyt Taylor, indeed, illustrates the permeability of seemingly distinct fields of radio: academic, hobbyist, and naval. In 1916 Taylor, then a physics professor at the University of North Dakota, submitted a paper to the IRE *Proceedings* concerning radio receiving systems. It described the potential

of concealing a radio antenna underground—an idea that, unbeknownst to him, was being pursued by the Navy in a classified project, under contract. The Navy, learning of the manuscript, asked Taylor to retract it; he responded graciously with "a very fine patriotic letter stating that he was very glad not to publish the article, that he was very happy to be able to cooperate with the Navy," and offering his assistance if needed in the future.[40]

In time, BUENG's Radio Division, under Stanford Hooper, discovered that its contractor working on a radio direction finder "could make it work but he couldn't explain how it worked. . . . [O]f course, I [Hooper] couldn't understand how it worked and neither could Mr. Clark of the [Engineering] Bureau."[41] Hooper wrote Taylor asking him to undertake the task of discovering the scientific principles by which the radio direction finder operated. Taylor accepted. Three years and a world war passed before Taylor's paper on the subject was published in IRE's June 1919 *Proceedings*. In the meantime, the professor found himself drawn into the war effort, first as a civilian and then, in the Naval Reserve, as district communication officer of the Great Lakes Training Station, then commanding officer of the Navy receiving and control center at Belmar, New Jersey, supervising the transatlantic network. After the war he went on to lead the Hampton Roads Air Station Experimental Division and finally to head the Naval Aircraft Radio Laboratory at Anacostia Naval Air Station (whence he was transferred to NRL).

The multiform careers of Taylor, Mirick, Luke, and Miller show that though it is tempting to classify radio experts of that era as products of either industry, the Navy, or academia, these individuals commonly passed among two of these communities or more. Mirick's career demonstrates the permeability of these fields, by which winding chains of innovations were fostered, with devisers of cutting-edge ideas producing novel systems based on experiences of colleagues in other fields. As people moved, so too did their ideas.[42]

Just as the pool of Navy-supported radio experts was reduced to meet shrinking postwar budgets, the world of amateur radio was taking off, with a growing number of users spending an increasing amount of money on ham radio sets and parts. In 1922 alone, the American radio industry was worth about sixty million dollars (in 1922 dollars—about $813 million today).[43] Stanford Hooper's archived papers are interspersed with more than a dozen letters from colleagues and naval subordinates bidding farewell as they accepted positions in RCA, Marconi, and many smaller radio firms.[44] On one hand, private industry functioned as an alternate career path where the Navy's innovative thinkers could build constituencies in private industry or weather interwar reductions in force. But on the other hand, Hooper and Taylor were left struggling to retain their choice research corps. By the time NRL began coming together in 1922, Hooper, its

BUENG proponent, had seen to it that the facility would possess a staff that was well qualified, if—as was characteristic of the interwar Navy—undermanned and underfunded.

NRL administrators grappled with what seemed to them limitless research problems and at the same time inexorable cuts to salaries, travel funding, and matériel. In June 1923, as the laboratory was still tooling up, Edgar G. Oberlin, its director, and Taylor wrote the head of the Bureau of Engineering outlining the nineteen research problems that would guide NRL's radio work. Of these, one alone was "almost sufficient in scope to tie up every man in the laboratory who knows anything about tube transmitters." They reported that no one was available to be assigned to six of the research problems.[45]

In the face of resource limitations, many questioned the prudence of devoting researchers to the uncertain field of HF at all. Throughout the early and mid-1920s the Navy researchers' advance into the HF spectrum was met with resistance from naval officers worried that people who were in one officer's words "hipped on HF" might be leaping too quickly into an unproven field. From their perspective, these frequencies demanded too much money and occupied too much of NRL's time. "I have to keep my eyes [figuratively] on the ground," explained one critic, convinced that work in HF would come at the expense of improvements to more reliable communications technologies already in the fleet.[46]

Hooper, who had faced similar resistance with the adoption of lower-frequency radio at the turn of the century, believed that making Navy users more knowledgeable would facilitate modernization. Thus, from the first a radio school was colocated at NRL. In February 1925, as BUENG was building up to routine operation in the high-frequency spectrum, Hooper wrote Taylor of his hope that a constituency of radio operators could be built who were not only open to the improvement of their hardware but willing to collaborate in its systematic "reinvention." Hooper and Oberlin agreed that the school's physical and intellectual proximity to the cutting edge of radio research would enrich the students' training. With an understanding of the adaptability of HF radio to needs of the Navy, fleet radio officers would be able to "make intelligent recommendations" that would "fit with those in Washington." Hooper intimated, "It has always been my experience that the Fleet lagged way behind the Research Staff in recommendations, because of lack of knowledge as to what *could* be done." This disconnect, he knew, could delay the approval of new equipment for years.[47]

By 1927, one of Taylor's amateur collaborators temporarily employed by the Navy and soon to return to the private sector reported to readers of the U.S. Naval Institute *Proceedings* that "high frequency radio is in the Navy to stay. It is surpassing any other form of radio by leaps and bounds. . . . With apparatus occupying only a tiny amount of space, as compared to the ancient arc[,] . . . the

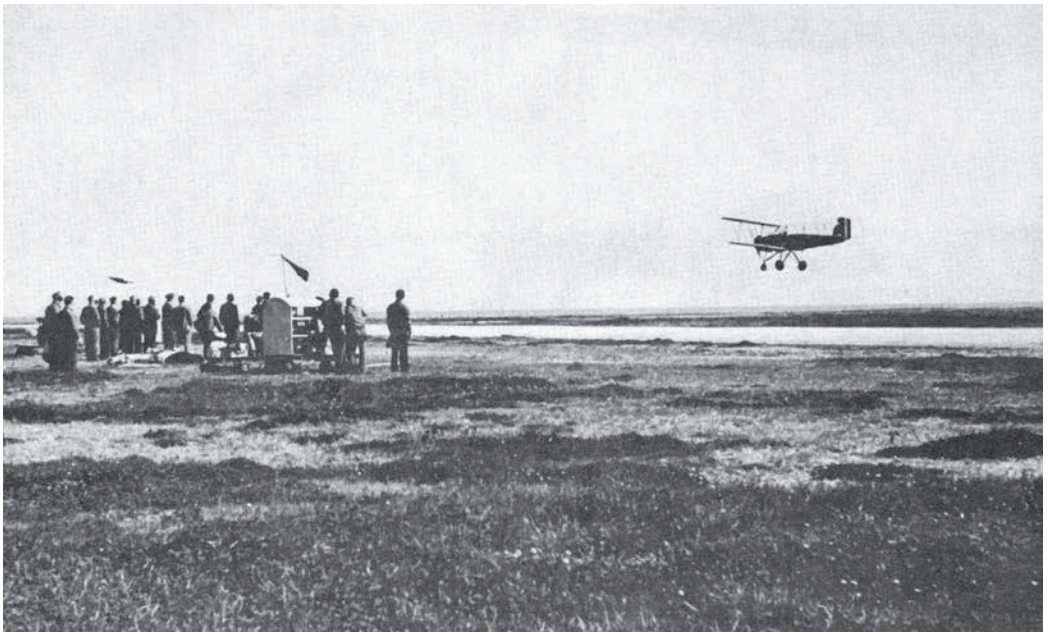
ships of the fleet are maintaining direct contact with Washington over distances practically impossible on low frequency and with infinitely less power."[48] Such advancements in hardware and human resources would buttress the reliability and performance of NRL's next generations of radio control.

RADIO AND 1930S MODERNIZATION: THE PROMISE AND THREAT OF AIRPOWER

For ten years, plans for a remotely controlled "flying bomb" lay dormant in BUENG and the Bureau of Ordnance (BUORD). However, Mirick and his group at NRL remained anything but inactive. In spite of the *Wild Goose*'s apparent dead end, NRL retained the plans for radio-control equipment and adapted it to ostensibly unrelated undertakings by other groups. The most immediate beneficiary, Carl Norden, used Mirick's system to synchronize the release of bombs, testing and calibrating experimental bombsights in the late 1920s.[49] Working alongside Dahlgren engineers, Norden developed a mechanical system to render bomb trajectories more predictable and effective. This preliminary research led eventually to the famous Norden bombsight.

While the efficacy of the Norden bombsight remains disputed, perhaps the most rewarding return on Mirick's radio-control system was in gradually "unmanning" targets, making it possible for ships, aircraft, and submarines to attack realistically maneuvering targets with minimal risk to Navy personnel. In 1930 Mirick personally oversaw the installation of his sequential radio controls on board the destroyer *Stoddert* (DD 302) and in 1932 on the converted battleship *Utah* (AG 16, originally BB 31). These ships served as test beds for three and nine years, respectively, proving worthy quarries for surface ships, submarines, and aircraft. Personnel who would otherwise have been exposed to great danger on the bridge operated the craft from a safe distance (though skeleton crews often remained below deck on ships). Thus, the ships could imitate the speed and evasive maneuvers of a well-commanded ship under attack, with minimal risk.[50]

Radio controls intended for Mirick's "flying bomb" were thus transferred to new communities, where they were used to refine operating procedures for the Navy's oldest and newest equipment. Battleships, cruisers, and destroyers practiced long-range firing on drone-towed target rafts. Submariners stalked and fired on surface targets. Naval aviators used drone target ships to develop tactics for dive-, torpedo, and high-level bombing. This was to prove a critical time in the Navy's development of carrier techniques and doctrine, in terms of both interservice rivalry and heightening international tensions.[51] Thus, it may be that the twilight years of *Stoddert, Utah,* and other ships used in similar ways were their most historically significant. *Stoddert,* operating in the Mobile Target Division 1 out of San Diego, helped train aviators assigned to *Saratoga* (CV 3),



NRL's second generation of aviation radio control was first tested on 19 November 1937. Less than a year later, NRL's system provided guidance for the nation's first maneuverable aerial target.

the second American ship originally commissioned as an aircraft carrier.[52] In the increasingly tense years of the late 1930s, *Utah* towed targets for battle practice, provided mobile target services to submarines, and served as a mobile target for Patrol Wing 1, as well as for attack aircraft based on the carriers *Lexington* (CV 2), *Saratoga,* and *Enterprise* (CV 6).

Throughout the 1930s and even into the 1940s, Navy commanders employed NRL radio controls in intensive field trials—both on the sea and on the wing. Yet all the while the laboratory's research in remote control remained a work in progress. As something of a prototype, *Stoddert* eased the transition to the next generations of radio-controlled target ships, including *Boggs* (DE 136), *Lamberton* (DD 119), and *Utah*. When not under radio control as a target, *Utah* served as a fleet machine gunners' school; in 1938, *Utah* gun crews practiced firing on remotely piloted N2C-2 aircraft simulating dive-bombing attacks. Radio control for these aircraft—descendants of Mirick's *Wild Goose*—had been designed by NRL's Radio Division.

REINVENTING THE NAVY: N2C-2 DRONES

It was not until the failure of the Naval Disarmament Conference of 1935–36 that the paths of the Naval Aircraft Factory, NRL, the Bureau of Aeronautics (BUAER), BUORD, and BUENG converged in pursuit of a field-ready and mass-producible target drone. When the Japanese delegates walked out of the London conference, fifteen years of voluntary arms limitations among the U.S., British,

Japanese, Italian, and French navies ended; a naval race seemed unavoidable and war probable. The U.S. Chief of Naval Operations, Admiral W. H. Standley, who had attended the conference, returned home determined to revive radio-control research, this time for target aircraft. War production was imminent, and drones would not only aid in the training of sailors and pilots but help Navy leadership evaluate current antiaircraft practice.

The systems that resulted could be identified as the first drones, not because they were the first remotely piloted aircraft (they were not), but because these were the first remotely piloted aircraft given that name. The name was likely suggested by NRL's Hoyt Taylor, who was confident that "to those who know anything about honey bees, the significance of the term will be clear. The drone has one happy flight and then dies."[53] While in the United Kingdom, Standley had observed demonstrations of target planes operating under the QUEEN BEE program; he returned declaring that an urgent need for targets demanded that researchers push development and experimentation to the very limit.[54] Many viewed the exercises that would then be conducted not simply as tests of the skills of gunners but as a way to settle a dispute between BUAER and BUORD regarding the overall efficacy of antiaircraft weapons. For its part, BUENG, as home of the Navy radio research, expressed its "keen desire to handle the development of the radio equipment."[55]

BUAER, meanwhile, searched for an aviator qualified in aerodynamics and capable of supervising the radio equipment R&D. In July 1936 it selected Lieutenant Commander Delmar S. Fahrney. Just as Mirick had surveyed the state of the art in 1922, Fahrney was instructed to engage in a comprehensive study of previous projects in radio control.[56] Assigning the project maximum priority, BUENG placed NRL in charge of radio control, working with the engineering group at the Naval Aircraft Factory. In a continuity that undoubtedly saved time and money, former chief radioman Elmer Luke returned to work full-time on radio control, this time as a civilian researcher improving an oscillating-reed circuit recognized by all parties as based on a principle that had been engineered into a workable system under the guidance of Hoyt Taylor, Carlos Mirick, Leo Young, and Matthew Schrenk in the 1920s. More than fifteen years after Mirick had begun the first round of work, NRL's radio engineers improved on his electromechanical airfoil controls, making them reliable enough for the simultaneous operation of multiple functions.

Demonstrations held on 17 February 1937 succeeded, with the "mother plane" twenty-five miles from the drone. The filter managed to segregate signals for aileron, elevator, throttle, and autopilot using a magnetically driven reed to vary magnetic flux through a coupled coil, thus averting complications experienced

with Mirick's earlier filter, which had used a vibrating contactor. Whereas Mirick exercised resourcefulness in securing custom-made switches, relays, amplifiers, and the like for his N-9 HF equipment, an NRL report observes that the N2C-2 project had been bequeathed over the previous decade "comparatively sturdy and dependable high-frequency units *used as standard equipment*. . . . With more reliable sending and receiving equipment the prospects for success were greatly enhanced."[57] High-frequency radio was coming into its own, with standardized and mass-producible assemblies and parts.

Lieutenant Commander Fahrney, who had been the chief inspector of the Naval Aircraft Factory before becoming the officer in charge of the drone program, proved a valuable partner to NRL. In hindsight, Taylor felt, "One reason that progress for this problem in earlier days [i.e., Mirick's "flying bomb"] had not been more rapid was because no strong high level of coordination had been applied to it. Captain Fahrney supplied this in an admirable fashion."[58] Once made rugged, reliable, and affordable, HF radio control could be "black-boxed" and applied to fleet exercises. Thus the radio-controlled drone, once the subject of Mirick's R&D, became a diagnostic tool in and of itself.

The results of this drone development, known as Special Project D, proved heartening to the radio researchers but generated data that appalled naval commanders preparing for a probable war. In 1938, the chief of BUAER sent congratulations to the chief of BUENG on the performance of NRL equipment in drone tests. He reported with pleasure that in 187 flying hours under radio control, few failures had occurred. This reliability he attributed to the vision, technical judgment, and directive ability of NRL scientists and engineers. The ability to "unman" aircraft in field test demonstrations revealed that neither antiaircraft (AA) gunners nor their equipment was performing to satisfaction. In the spring of 1939, multiple drone-target runs on the destroyers USS *Patterson* (DD 392) and *Reid* (DD 369) and the battleship *Idaho* (BB 42) produced but a dozen or so bullet holes and no drone kills. Taylor later recalled that "it was quite a while before one of these targets was brought down by a Naval gunner"; in the meantime much troubleshooting ensued, reshaping antiaircraft doctrine for years to come.[59]

In August 1938, N2C-2 drones made scheduled runs over the carrier *Ranger* (CV 4). Its gun crews, well trained by the standards of those days, failed to score a single hit. In September 1939, *Utah* expended 1,500 rounds from its 1.1-inch batteries against nine dive-bombing "attacks" without downing a drone. NRL's Louis Gebhard would recall, "The rapid increase in the use of drones quickly revealed the inadequacy of our antiaircraft defense against maneuvered targets and led to more rapid improvement of our fire-control systems."[60] But ultimately, as Admiral Claude C. Bloch, then Commander in Chief, U.S. Fleet, stated, "The

firings against radio-controlled target airplanes have proved of inestimable value in testing the efficiency of the antiaircraft defense of the Fleet and in determining the procedures which should be used to make antiaircraft fire most effective."[61]

Between 1939, when a drone services group was formed, and the fall of 1940, gunners began scoring more hits, learning how resilient aircraft were against AA weaponry and, again, showing what Navy leadership could anticipate in battle. In spring 1940, the Secretary of the Navy designated Rear Admiral Ernest Joseph King to make a special study for the improvement of antiaircraft batteries. That August, the Chief of Naval Operations created the Navy Department Antiaircraft Defense ("King") Board to study options for improving antiaircraft batteries. Ultimately, the target drone trials led to a number of fleet adaptations.[62] By December the King Board had declared that the Navy's lack of close-range AA gun defense constituted the "most serious weakness in the readiness of the Navy for war."[63] In this way drone tests led to demands for improved optical fire-control systems, encouraged the installation of radar fire control on ships, aided in development of proximity fuses for AA guns, and finally, made it clear that gunners needed more training and longer assignments to that specialty. Through the early years of World War II, demand for drones rose steadily. The Navy soon exceeded its supply of surplus military aircraft and began procuring small commercial planes to use as targets—twenty a month in 1942, then sixty, and finally eighty a month in 1943, by which time the U.S. Army and the Royal Navy had begun placing orders too.[64] Through the end of the Second World War, drones continued to be employed in gunnery training; radio control was installed in F6F aircraft to simulate kamikaze attacks. In 1946, radio-controlled F6Fs were transported to Bikini Atoll to monitor and evaluate a whole new weapon—the atomic bomb.[65]

YESTERDAY AND TODAY: LESSONS FOR MAINTAINING THE STRATEGIC EDGE

This interwar case study offers six lessons for thinking about research and development today. The point is not to claim that U.S. drones were invented by NRL researchers, in isolation. They were not. NRL was but one institution through which the Navy advanced its stake in the fast-developing radio age. There, researchers adapted innovative ideas from across the United States and abroad to Navy needs; they worked to forecast plausible capabilities of the U.S. Navy and potential adversaries; and they kept on hand experts to aid in matters ranging from patent disputes with private industry to emergency R&D, such as Project D. What matters here are the difficult decisions faced by researchers, their administrators, Navy sponsors, and collaborators operating at the cutting edge of radio R&D.

For the world's navies, the interwar period was a time of intense scrutiny, from naval leadership, citizens, budget makers, and potential adversaries. Because of

its response to this interwar scrutiny—testing, evaluating, and rethinking the role of old and new battle platforms—when the "sleeping giant" was awakened in December 1941, the U.S. Navy bore little resemblance to the Navy of 1919. Historians have observed that the interwar Navy, constrained as it was by postwar drawdowns, Depression-era budgets, and disarmament agreements, "fostered an innovative spirit among American admirals that made them better able to fight the Pacific war."[66] Yet it is critical to note that it was by no means the treaty limitations, fiscal conservatism, or interservice rivalries that facilitated innovation. Instead, these conditions shaped the political economy in which naval administrators, researchers, and engineers operated, a setting that occasionally made them more amenable to technological change.

The first lesson arises from the fact that during this time engineers invented neither submarines, nor aircraft, nor HF radio. Instead, military and civilian experts spent the interwar decades methodically testing the efficacy of those technologies in laboratory and field trials and weighing plausible adjustments to preexisting systems. It took a tremendous amount of work in a number of institutions to bring research to the point of producing prototypes, and then effective operational systems. But ultimately, these years of exploratory HF-radio R&D laid a foundation on which Navy researchers and their industrial partners were to build for decades.

Second, the field of radio is big and still growing. Like aviation and space, it is defined as much by the fundamental properties of a medium as by the technologies and countermeasures necessary for operation therein. From 1924 to 2014, drones have represented only one platform in a rich field of promising technologies at the cutting edge of research. As illustrated by the case of Carlos Mirick, at this epistemic edge critical breakthroughs commonly result from tracking down and integrating tools and insights from complementary fields, be the source a division down the hall or a manufacturer in another country. Such interactions remain necessary conditions for revolutionary innovations as well as incremental adaptations.

Third, for many, natural and man-made vagaries of the electromagnetic spectrum do not matter until they impede operations; such impediments are often stumbled on, though sometimes they are anticipated. Similarly, good ideas may circulate by chance, or they may be preemptively cultivated. A recent study analyzed the origins of the aircraft carrier angled flight deck.[67] One of its findings was a disconnect between the U.S. Navy's aviators, who recognized the utility of deck-edge aircraft carriers as used by the Royal Navy (RN), and the Navy's technical specialists: "There was plenty of talent available to both navies, but having the right individuals in the right place at the right time is often a matter of chance, and chance favored the RN."

In fact, administrators like Hooper and Taylor did accept that some variables must inevitably be left to chance. It was not simply the invention of radio control that aided the Navy in those interwar years of testing, evaluation, and painful retrenchment but innovation coordinated with both serendipitous and structured circulation of ideas. This interaction fostered the adaptation of both successful ideas and seemingly failed ones to new activities, leading to this essay's fourth observation: in many regards, material and intellectual connections mitigated the uncertainty and risks of exploratory R&D—scientists moving among laboratories, engineers sharing building plans with industrial partners, researchers critiquing one another's methods and consulting with operators. Among these communities, good ideas persisted and breakthroughs in fundamental knowledge were disseminated. These circumstances could cast the concept of "R&D dead end" in a new light. Indeed, neither Lawrence Sperry's defunded guided bomb, Hammond's torpedo development, Mirick's *Wild Goose,* nor even Fahrney's aspirations for a follow-on guided-missile program reached their intended ends.[68] Fourth, in the larger fields of radio, aviation, and naval tactics, these seeming dead ends contributed to the successes of other platforms, programs, and careers that were conducive to the U.S. victory in World War II. In an institutional setting of stability and intellectual latitude, as well as sustained receptivity to testing, evaluation, and (re)training, ideas and hardware weathered periods of uncertainty and were applied to entirely new projects, where they flourished.

Whereas in 1923 NRL conducted R&D with two in-house research divisions, by the end of World War II the laboratory's pool of expertise had expanded considerably in scale and scope, but still featured many overlapping research problems. Recalled Hoyt Taylor:

> I can not [*sic*] close this account of the functions of the Radio Division without calling attention to the fact that many of our problems are linked with other Divisions upon whom we may call freely for aid and assistance in solving our problems. In particular, the Division of Physical Optics has been of enormous assistance in the Wave Propagation studies and naturally a very close connection exists between the Sound Division and the Radio Division, many of whose problems almost overlap. The Divisions of Physical Chemistry and Metallurgy have also come frequently to the aid of the Radio Division. The presence of these other Divisions is therefore of material aid and assistance to the solution of radio problems peculiar to the Naval service.[69]

By 2014, this, the Navy's corporate research laboratory, employed more than 1,500 technical personnel in eighteen division-level organizations. It functions today as a microcosm of the sciences, with a multeity seldom found within one institution.

Whereas Ballentine and Mirick circulated among engineers, Navy radiomen, radio physicists, and the service's most capable pilots, these days drone R&D is

more likely to bring together a plasma physicist and an expert in artificial intelligence. This change is, in part, a reflection of a broad and consistently expanding sampling of the sciences available to the Navy in NRL, including the Nanotech Institute, Tactical Electronic Warfare Division, Center for Biomolecular Science and Engineering, and the Laboratory for Autonomous Systems Research, all formed since 1923. But also, today's work demands far more complicated inputs for payloads and systems integration.

Vehicles of the twenty-first century operate in networks of ever-extending reach. The notion of "remote control" takes on new meaning when drone operators and their aircraft are thousands of miles apart. In what has been described as "remote split operation," drone pilots often function in different cities, time zones, or continents from their environments of interest. Autonomous systems, robotics, distributed systems, UAVs, or remote split operation, call them what you will—these capabilities bring with them many new complexities, in design, management, and institutional jurisdiction. As researchers have sought a more centralized forum to facilitate R&D, policy experts and a few military commanders have begun to question the curious lack of an arena for formal exchanges concerning the development and operation of UAVs, and of robotics writ large.[70]

Proponents of such forums resist relying on chance. They are calling for more sustainable and more widely reaching institutions to facilitate interorganizational research, development, and testing to improve field operations. In 2007, thirty-three researchers representing five NRL divisions coauthored a report proposing a joint task force to oversee the development and evaluation of weapons systems.[71] Therein they argued that distributed autonomous systems of sensors—on wing, land, and water—would prove themselves as interservice joint-task-force assets for forward operational sensing, search and rescue, fleet and land mine countermeasures, and antimissile defense.[72] Significantly, the report suggested that a tiered systems-development process would combine the skills of military operators, academia, industry, and management and operational contract laboratories. These collaborators might contribute to a "red team" that would participate in developing and evaluating improved joint systems capabilities by taking the perspective of potential adversaries and deliberately devising challenges.

No such red team was instituted. A few years later, in 2011, the chief of the operations branch at the Joint and Army Experimentation Division observed that there was still "no unified strategy or governance structure that moves away from the stove-piped approach and integrates concept development, requirements, and capabilities assessment."[73] Echoing to a degree Hooper's HF concerns of a hundred years earlier, that commentator wished not only to "prove with analytical rigor that robots are a preferred solution to address capability gaps" but to

create a centralized forum for discussing the best possible operation of these new systems, as well as their consequences.[74]

As our case studies lead us to expect, critical breakthroughs in complementary fields are indeed advancing the fields of drone R&D. To what degree will today's researchers, administrators, sponsors, and industrial partners leave such variables to chance? Scientific and manufacturing innovations like improved autopilot, smaller microprocessors, and lighter and more durable materials have ushered in a renaissance for remotely piloted aerial vehicles, taking them well beyond the form and function of the early twentieth century and arguably to the point of "autonomy." Miniaturization and mass production have helped reduce costs to the point at which remotely piloted craft can be considered "expendable," even disposable. Many suggest this—a hundred years into drone testing and development—is just the beginning of what the drone platform can offer when integrated with other emerging systems: improved navigation, fuel cells, laser communication, improved remote sensing, remote memory storage, and various forms of countermeasures, and counter-countermeasures.

Fifth, the United States has never in fact been alone in the field of drone R&D. Since at least the 1920s, radio researchers have benefited from inputs from abroad (such as intelligence concerning German torpedoes or feedback from the British QUEEN BEE proof-of-concept aircraft). More often, however, radio R&D has been driven by military *threats* from abroad.[75] Thus one of the "consequences," mentioned above—that is, mass production and economies of scale are driving down prices but in doing so are also dissolving barriers to entry by potential adversaries. Nine decades after the first "unpiloted" flight of *Wild Goose,* a host of new battlefield threats face drone operators, commanders, and developers of Navy equipment. The current Chief of Naval Operations, Admiral Jonathan Greenert, has predicted that by 2025, radar, electro-optical sensors, and "precision-guided weapons will be the norm among our adversaries and competitors—from terrorist groups to criminal organizations to our maritime peers."[76] This gradual convergence of technical capabilities aids nonstate actors, terrorists, and insurgents, who pose sustained threats to foreign and domestic security.

Thus—sixth, and finally—as isolated technologies become available to adversaries, well-governed and effective networks among the armed services, intelligence community, and their diverse research-and-development communities may prove the critical edge for the United States.

NOTES

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1. For an overview of that reevaluation see Albert A. Nofi, *To Train the Fleet for War: The U.S. Navy Fleet Problems, 1923–1940* (Newport, R.I.: Naval War College Press, 2010).
2. Capt. L. S. Howeth, *History of Communications-Electronics in the United States Navy* (Washington, D.C.: U.S. Government Printing Office, 1963), chaps. 3–10.
3. In 1915, the Naval Consulting Board began petitioning for the formation of (in the words of Josephus Daniels, Secretary of the Navy, in September 1915) "an adequate central establishment where the ideas of its own officers as well as those suggested by civilians could be taken up and patiently developed in the same way that such ideas are handled in great manufacturing establishments." Quoted in David Allison, *New Eye for the Navy: The Origin of Radar at the Naval Research Laboratory,* NRL Report 8466 (Washington, D.C.: Naval Research Laboratory [hereafter NRL], 1981), p. 25.
4. David van Keuren, "Science, Progressivism, and Military Preparedness: The Case of the Naval Research Laboratory, 1915–1923," *Technology and Culture* 4 (October 1992); Allison, *New Eye for the Navy,* chap. 2.
5. Though the Naval Consulting Board was appropriated $1.5 million for NRL on 4 March 1917, the laboratory's location was not resolved until February 1918. Details of this conflict and compromise are available in Allison, *New Eye for the Navy,* pp. 28–32.
6. Stated Hooper, "I felt very strongly that it ought to be located near enough to Washington to help people like myself in charge of research and development work who could easily avail themselves of the facilities and make frequent visits to the laboratory. . . . [O]therwise, we had to take the train and spend a day or two every time they [*sic*] made a visit to the laboratory." Rear Adm. Stanford C. Hooper, USN, Ret., "Navy History of Radio-RADAR-SONAR," p. 746, Stanford C. Hooper Papers, box 24, Library of Congress Manuscript Division, Washington, D.C. [hereafter Hooper History of Radio].
7. "Personnel under Present Title and Pay," folder NRL Historical Records 1916–1939, NRL History Office, NRL, Washington, D.C.
8. Stanford Hooper to H. H. Bouson, USN, 1 March 1926, folder January–April Correspondence 1926, Stanford C. Hooper Papers, box 7, Library of Congress Manuscript Division, Washington, D.C.
9. Ibid.
10. Hooper described Navy radio research as being scattered across the United States from New London, Connecticut, to Pensacola, Florida. Material assembled by Rear Admiral Hooper for Hooper History of Radio, pp. 745–46.
11. Louis A. Gebhard, oral history interview by David K. Allison, 12 September, 19 September, and 3 October 1977, p. 26, NRL History Office, NRL, Washington, D.C.; Hoyt Taylor, *The First 25 Years at the Naval Research Laboratory* ([Washington, D.C.]: NAVEXOS [Executive Office of the Secretary of the Navy], 1948), p. 13.
12. Louis A. Gebhard, *Evolution of Radio Electronics and Contributions of the Naval Research Laboratory,* NRL Report 8300 (Washington, D.C.: 1979) [hereafter *Evolution of Radio Electronics*], p. 26.
13. Hoyt Taylor, *Radio Reminiscences: A Half Century* (Washington, D.C.: NRL, 1960), p. 104.
14. Ibid., p. 77. See also Richard K. Smith, *First Across: The US Navy's Transatlantic Flight of 1919* (Annapolis, Md.: Naval Institute Press, 1973).
15. Thomas Parke Hughes, *Elmer Sperry: Inventor and Engineer* (Baltimore: Johns Hopkins Press, 1971), p. 269; Carlos Mirick, "A Wild-Goose Chase: Early Navy Work on Pilotless Aircraft and Ships," U.S. Naval Institute *Proceedings* (July 1946), p. 947.
16. Mirick, "Wild-Goose Chase," p. 947.
17. Allison, *New Eye for the Navy,* p. 37.
18. Gebhard, oral history interview.
19. Henry Stroke, ed., *The* Physical Review: *The First Hundred Years—A Selection of Seminal Papers and Commentaries* (New York: American Institute of Physics, 1995). Taylor and

E. O. Hulbert's "The Propagation of Radio Waves over the Earth," dating from the 1926 *Physical Review,* is listed on pp. 1126–27.

20. Allison, *New Eye for the Navy,* p. 45.
21. Details of their rejected proposal and repeated efforts can be found in ibid., pp. 40–41. Years later Hooper would explain that the reason BUENG chose to hold off on investing in radar was that radio researchers lacked "a proper generator or [vacuum] tube, which could generate short waves" (ibid., p. 40).
22. Mirick, "Wild-Goose Chase," p. 947.
23. Gebhard, oral history interview, p. 28.
24. Ibid., p. 29.
25. Mirick, "Wild-Goose Chase," p. 948.
26. Miller acquired his PhD from Yale in physics in 1915. A radio physicist and patent expert, he left NRL for a position in Atwater Kent Manufacturing Company, then went to the RCA Radiotron Company. He returned to NRL's Radio Division in 1940, ultimately serving as NRL's scientific research administrator in 1952. In 1953, the Institute of Radio Engineers awarded Miller the IRE Medal of Honor for "his pioneering contributions to our basic knowledge of electron tube theory, of radio instruments and measurements, and of crystal controlled oscillators." "John M. Miller Biography," *IEEE Global History Network,* www.ieeeghn.org/.
27. Mirick, "Wild-Goose Chase," p. 949. In fact, only recently had vacuum tubes become commercially available, with mass production slowly lowering cost.
28. Taylor, *First 25 Years at the Naval Research Laboratory,* p. 7.
29. By 8 October 1922, the press was reporting that the teletype could function several hours at a time, with the transmitter and seaplane receiver (described as a printer) fifty miles apart. These experiments were early proof-of-concept exercises, demonstrating that radio communications could be established between the assemblies at such distances. Stanford C. Hooper, "Typewriter Operated from Seaplane in Flight," *Washington, D.C., Sunday Star,* 8 October 1922.
30. Officer in Charge [Ballentine] to Inspector of Ordnance in Charge, 17 October 1924, folder Naval Aviation Radio Controlled Flight Experiment 1924, Papers of John J. Ballentine, box 18, Library of Congress Manuscript Division, Washington, D.C. [hereafter Ballentine Papers].
31. Mirick, "Wild-Goose Chase," p. 950.
32. Ibid.
33. Watching the machine wander by itself over the streets of NRL, stopping, starting, and turning corners, Mirick observed that the revolving, riderless pedals lent the contraption "a somewhat jaunty air"; it was soon christened the Electric Dog. Parenthetically, Mirick suggests that young Robert Luke harbored no ill will over the Navy conscription of his velocipede; Luke became an NRL radio engineer during the 1940s.
34. Carlos Mirick, inventor, Electrical Distant-Control System, U.S. Patent 1,597,416, filed 1 September 1923. The patent was issued in August 1926, listing Mirick as inventor, naming no assignee. Currently, where an invention is made by a government employee, the government of the United States, as represented by the Secretary of the Navy, is listed as the assignee of the patent if any of the following conditions apply to the making of the invention: if the invention was made during working hours; if the invention was made with a government contribution of facilities, equipment, materials, funds, or information, or the time or services of other government employees on official duty; or if the invention bears a direct relation to or was made in consequence of the official duties of the inventor. The author thanks the NRL Head Office of Associate Counsel for Intellectual Property for assistance on this point.
35. Taylor, *Radio Reminiscences,* p. 126.
36. In Ballentine's report: "The disadvantage of only being able to work one control at a time was especially apparent during the landing, when it was desired to use the elevators and the throttle at the same time." Ballentine, "Radio Controlled Flight Experiment, Report Of," 17 October 1924, folder Naval Aviation Radio Controlled Flight Experiment 1924, Ballentine Papers, box 18.
37. Mirick insisted that this was not owing to a failure in the radio controls. Mirick, "Wild-Goose Chase," p. 951.
38. High-frequency radio could broadcast to distances on a par with the transatlantic low-frequency radio; however, the reach of HF

communication remained quite unpredictable and unreliable at the time. Regarding the more compact nature of antennae and power supplies, Hooper recalled that the powerful spark-gap transmitter made enough noise to be heard half a mile away. Hooper History of Radio, p. 763.

39. The BUENG Monthly Radio and Sound Report was limited to Navy readers.

40. Hooper History of Radio, pp. 843–45.

41. Ibid.

42. For an excellent sampling of the circulation of radio experts among communities of radio innovation, see Raymond Yates and Louis Pacent, *The Complete Radio Book* (New York: Collier & Son, 1922), chap. 17, "Who's Who of Radio," pp. 286–315.

43. Hugh Aitken, *Syntony and Spark: The Origins of Radio* (Princeton, N.J.: Princeton Univ. Press), pp. 499–501.

44. Evidence of this exodus from the Navy to the private sector includes letters addressed to Mr. Young of RCA, 14 April 1920, folder January–April 1920, box 3; and to Commander Hooper, 12 June 1920 ("present salary is inadequate and . . . I have no assurance that there is a future for me in Government service"), folder May–August 1920, box 3. William Ellis to Commander Hooper, 5 April 1922, folder April 1922, box 4, credits the Navy for Ellis's rich on-the-job training: "I have been able to perfect myself in the fundamentals and theories of radio communication." On 7 April 1922 Hooper wrote Ens. W. A. Eaton that "although I am very sorry to see you leave the services, I will do nothing to prevent your taking advantage of the very advantageous conditions in radio on the outside"; folder April 1922, box 4. H. H. Buttner wrote Hooper on 5 May 1922, "Due to the intense activity in the radio field, I have been offered several rather attractive situations by outside concerns. . . . My decision is partly due to the probability of curtailment of Navy activity in general and radio work in particular"; folder May 1922, box 4. In a letter of 20 October 1922 addressed to "My dear Captain," Hooper suggests that to keep an Ens. C. D. Palmer ("probably the best radioman in practice") from taking advantage of one of many "good offers" made for him to leave the Navy, Palmer be transferred to work with Hoyt Taylor at NRL, where he might carry on his experimental work in radio; folder October–Nov 1922, box 4. Quotations from Stanford C. Hooper Papers, Library of Congress Manuscript Division, Washington, D.C.

45. Taylor and Oberlin to Director of BUENG, "Radio Telegraph Research Problems," 2 June 1923, folder NRL Historical Records 1916–1939, NRL History Office, NRL, Washington, D.C.

46. Letter to S. C. Hooper, unsigned, 12 February 1925, folder January–June 1925, Stanford C. Hooper Papers, box 5, Library of Congress Manuscript Division, Washington, D.C.

47. Stanford Hooper to Hoyt Taylor, 6 February 1925, folder January–June 1925 [emphasis added], Stanford C. Hooper Papers, box 6, Library of Congress Manuscript Division, Washington, D.C.

48. Lt. Cdr. F. H. Schnell, "The First Long Range High Frequency Radio Tests," U.S. Naval Institute *Proceedings* 53 (September 1927), p. 968.

49. Carl Norden is characterized as "an observer and occasional participant in the pilotless aircraft trials. Later, when the sight was being tested and calibrated at Dahlgren, a means was needed for releasing the bombs—from the ground—by remote control. Quite naturally, the Dahlgren engineers turned to Mirick's radio system." "The First Radio Controlled Airplane," unpublished manuscript, folder Radio Guidance, NRL History Office, NRL, Washington, D.C.

50. *Dictionary of American Naval Fighting Ships,* s.v. "Stoddert," www.history.navy.mil/; "USS *Stoddert* (DD-302; Later IX-35, AG-18 & DD-302), 1920–1935. Briefly Renamed *Light Target Number 1* in 1930–31," *Naval Historical Center* [*sic*—Naval History and Heritage Command website], www.history.navy.mil/. Reminiscent of the N-9 *Wild Goose, Utah* was also guided by a Sperry "metal mike," or gyro pilot, to help keep the ship on course. "USS *Arizona* Memorial: Submerged Cultural Resource Study—USS *Arizona* and Pearl Harbor National Historic Landmark," *National Park Service,* www.nps.gov/.

51. This was as much a matter of proving the potency of ships against attacking aircraft as the efficacy of carrier-based aircraft against land-based planes. See Russell Weigley, *The*

American Way of War: A History of United States Military Strategy and Policy (Bloomington: Indiana Univ. Press, 1977), pp. 223–65.

52. *Dictionary of American Naval Fighting Ships,* s.v. "Stoddert." USS *Langley* (CV 1) was originally commissioned as a collier.

53. "I believe I am responsible for this name for pilotless target planes." Taylor, *Radio Reminiscences,* p. 96.

54. William Trimble, *Wings for the Navy: A History of the Naval Aircraft Factory, 1917–1956* (Annapolis, Md.: Naval Institute Press, 1990), pp. 188–90.

55. Howeth, *History of Communications-Electronics in the United States Navy,* p. 480.

56. Ibid.

57. "Radio Control of Target Drones (N2C-2 Training Plane Used as First Radio-Controlled Experimental Target Drone)," folder Radio Guidance, NRL History Office, NRL, Washington, D.C. [emphasis added]. The report is undated but bears a handwritten note indicating that the original was transferred in 1962.

58. Taylor, *Radio Reminiscences,* p. 217. Granted, in 1923 the geopolitical incentive to innovate was not what it would be in the 1930s.

59. Ibid., p. 218.

60. Gebhard, *Evolution of Radio Electronics,* pp. 228–29; Howeth, *History of Communications-Electronics in the United States Navy,* pp. 483–84; Delmar S. Fahrney, "The Birth of Guided Missiles," U.S. Naval Institute *Proceedings* (December 1980), pp. 55–56.

61. Gebhard, *Evolution of Radio Electronics,* p. 228.

62. Howeth, *History of Communications-Electronics in the United States Navy,* p. 220.

63. Ibid.

64. Ibid.

65. Gebhard, *Evolution of Radio Electronics,* p. 229; Office of the Historian, Joint Task Force One, *Operation Crossroads: The Official Pictorial Record* (New York: William Wise, 1946), pp. 51, 60, 82.

66. Roger Dingman, "Navies at Bay," *Naval History* (December 2010), pp. 28–35.

67. Thomas C. Hone, Norman Friedman, and Mark D. Mandeles, "The Development of the Angled-Deck Aircraft Carrier: Innovation and Adaptation," *Naval War College Review* 64, no. 2 (Spring 2011), p. 75.

68. In 1939, Fahrney began work on combat assault drones in Project DOG and Project FOX. Five years later, the Navy conducted combat tests of the drones; most reached their targets, but they had little if any effect on the Pacific campaign. Delmar Fahrney later tried without success to establish that the 1930s drone projects had been precursors to later U.S. guided-missile projects and that he himself was the "father of guided missiles." After the Second World War, Fahrney sought a decoration for his drone work, for which the chief of the Bureau of Aeronautics, Adm. Alfred M. Pride, would not recommend him. Apparently Fahrney wished the recognition for combat-drone applications, not target-drone testing and use. See "The Reminiscences of Admiral Alfred M. Pride, USN (Retd)," oral history (Annapolis, Md.: U.S. Naval Institute, 1984), pp. 174–77, and Fahrney, "Birth of Guided Missiles," pp. 59–60.

69. A. Hoyt Taylor, "Functions of the Radio Division of the Naval Research Laboratory," folder NRL Historical Files 1916–1939, NRL History Office, NRL, Washington, D.C.

70. P. W. Singer, *Wired for War: The Robotics Revolution and Conflict in the 21st Century* (New York: Penguin, 2009), p. 362.

71. Jill Dahlburg et al., "Developing a Viable Approach for Effective Tiered Systems," NRL Report NRL/MR/1001-07-9024 (Washington, D.C.: NRL, 2007).

72. Ibid., p. 7.

73. Lt. Col. Anthony S. Cruz, "The Robot General," *Armed Forces Journal,* June 2011. At the time, Cruz worked in the Army Capabilities Integration Center, Training and Doctrine Command at Fort Monroe, Virginia.

74. Cruz suggests that such a forum would demand not brick-and-mortar expansion of facilities or a proliferation of research institutions but more modest exchanges, such as seminars and panel discussions.

75. By a matter of days, British researchers beat Mirick's *Wild Goose* to remotely piloted flight.

76. Adm. Jonathan Greenert, "Navy 2025: Forward Warfighters," U.S. Naval Institute *Proceedings* 137 (December 2011), p. 21.

FUTURE MINE COUNTERMEASURES

No Easy Solutions

Commander Martin Schwarz, German Navy

> *We have lost control of the seas to a nation without a navy, using pre–World War I weapons, laid by vessels that were utilized at the time of the birth of Christ.*
>
> REAR ADMIRAL ALLEN E. SMITH, U.S. NAVY, 1950

Admiral Smith's point might be as valid today as it was sixty-four years ago. It refers to mines that he faced off the coast of Korea. Naval (or sea) mines are, by themselves or in combination with other weapons, a promising choice to parties pursuing antiaccess/area-denial objectives. The number of mines in the stocks of countries around the world and the ease of laying them mean that sea control is very likely to be lost again in future tension and conflict. This article is an attempt to describe the means, and to some extent the methods, under consideration to win it back if the need arises again. Mines pose a threat not only to military use of the sea but also to civilian shipping. The global economy depends on secure access to the global commons. With roughly 95 percent of world trade being shipped by sea, it is clear how much the economy depends on open trade routes and sea areas.[1] Therefore, the capability to counter mine threats is needed to provide freedom of movement not only to one's own and friendly naval forces but to merchant shipping as well.

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The following research questions are at the heart of this analysis; the answers to them will help characterize the situation and prospects.

- What are the shortfalls of mine-warfare vessels today?
- What are the requirements for a future vessel?
- What concepts are currently under development?

To ensure a comprehensive picture, however, the analysis will go beyond these questions, to look at current developments and their potential future capabilities. The main issues will be discussed in more detail. It may be impossible to provide a definitive answer, as nations have varying purposes and ambitions for their forces. Emphasis will be put on capabilities rather than the vessels that carry them, as the focus seems to be shifting from a platform-centric approach toward a capability-based one. Argues one naval observer, "It is the mission system that is the key—once you understand that, you can understand what the replacement platform is going to look like."[2] The U.S. Navy's Chief of Naval Operations has declared, "We will need to shift from a focus on platforms to instead focus on what the platform carries."[3] His statement indicates that there may be a shift in the thinking of strategic planners. A platform focus may no longer be feasible. It is all about the capability a platform can carry and employ.

THE THREAT

This article cannot describe the various types of mines, their sensors, and their payloads. It will suffice here to mention, generally, that there are bottom mines (lying on or buried in the seabed) and moored mines (floating in the water column, held in place by an anchor or drifting on or just below the surface). Mines can be actuated by contact, by influence, or on command. Sea mines can sense ships' "influences"—magnetic, acoustic, pressure, seismic, and others, in various combinations. Sea mines employ techniques to defeat mine countermeasures (MCM). These include coatings, deceptive shaping, and self-burial to prevent detection by sonar. To counter minesweeping, mines use enhanced sensors and signal processors to recognize a sweep attempt and avoid premature firing. Modern sea mines can be programmed to target certain types of ships.

Even this brief summary should be sufficient to show that mines must today be seen as a real threat to alliance or coalition naval operations and civilian shipping. A recent example is offered by the 1991 Gulf war, in which coalition forces had to abandon a planned amphibious assault because of the presence of more than 1,300 mines.[4]

Sea mines are force multipliers. Even if they do not prevent a navy from acting, they can surely delay it for a prolonged period of time or force it to choose other options. The sea mine's goal is to deny access. Uncertainty alone about whether mines have been laid can achieve this effect. In fact, dummy mines—shapes that do not hold explosives or sensors—can delay MCM operations. Attention must be also paid to ordnance and ammunition already scattered on the seabed.

Sea mines can be laid by almost any vehicle, from dedicated minelayers to aircraft, submarines, pleasure boats, or fishing vessels. Even a sport-utility vehicle can drop one from a bridge into an important harbor. Mines can be used in a wide

range of water spaces, from the surf zone to depths greater than three hundred meters. They can be used defensively, off a state's own coast, or offensively, off an opponent's shores or harbors. Sea mines are one of the world's most widely proliferated weapons. Excluding the U.S. inventory, their number is estimated at around a million, of more than three hundred types, in the inventories of more than sixty navies—plus underwater improvised explosive devices (UWIEDs).[5] Although some effort has been put into limiting proliferation and tracking sales, there is no clear picture of where mines are, or have been, or to whom they are sold.

Sea mines are called "poor man's artillery" as truly today as they were decades ago.[6] An actor does not need to acquire the most sophisticated expensive modern mine. Older weapons, using technology of World War II or even older, can be as effective today as when they were state of the art. Traditional navies and maritime terrorists can use, and have used, not only mines but UWIEDs to obstruct military and commercial uses of the seas.[7] Both mines and UWIEDs are easy and cheap; they offer high effect for low cost. The older versions are quite simple, not requiring special training; they offer "affordable security via asymmetric means."[8]

Sea mines change the usability of the maritime environment. Especially near shore—since they are most effective in water depths between two hundred and ten meters—they force opponents to adjust their plans or clear sufficient areas for their forces to operate in.

SCENARIOS

"Scenarios," a distinguished scholar of military and security affairs has observed, "have much to recommend them as functional surrogates for the inaccessible, and indeed undesired, real thing."[9] Scenarios recommend themselves as guide rails for the development of requirements, and they should cover a wide spectrum of possible tasks in peace, crisis, and war. What are the likely scenarios for the employment of a future mine countermeasures capability? The focus has clearly shifted from European coastal waters to the littorals in distant areas of the globe. However, the possibility of operations to protect one's own harbors and approaches cannot be excluded. They might be conducted in peacetime conditions, in expeditionary circumstances, or in wartime. The following scenarios suggest themselves for further investigation:

- MCM prior to or during expeditionary operations off foreign coasts
- MCM in response to a mine threat in own and friendly waters
- Postconflict clearance operations.

Mine countermeasures prior to and during operations off foreign coasts must be seen as the most demanding for the platforms engaged in them. They are likely to be conducted at significant distances from home waters, by forward-deployed

units or after prolonged transits. Such a transit is ideally conducted ahead of a task force, in order not to delay its operations on arrival. The opponent, for his part, will have an interest in the protection of his minefields. He will pose threats by fast attack craft, land-based missiles, or artillery. Privately owned helicopters or unmanned aircraft are likely weapons to be used against MCM forces. Although the approaching task force should, and probably would, establish air superiority prior to the beginning of maritime operations, defense of a minefield by minor aircraft and watercraft is highly likely. Further, MCM operations off an unfriendly coast give away the intentions of one's forces. The recent operations off Libya can be seen as an example; MCM took place off the Libyan city of Misrata, in the face of threats from the coast.[10]

Information about the environment in the operation area—the key to efficient MCM—must be collected. The amount of knowledge available might be slight, especially compared with home waters. A rapid environmental assessment will be needed, preferably covert. If mines are detected, the boundaries of the minefield must be found. If there is an area free of mines, traffic should be diverted to it whenever possible.

The platform that performs these tasks may have to be able to do so covertly and must be able to protect itself effectively. Covering naval forces should not be counted on, especially if the MCM element arrives ahead of the force. Its range and sustainability must be similar to those of the other ships in the task force. Dependence on specialized supporting units, as is current practice, should be avoided, as the specialized ships required drive cost.

A response to mine threats in home waters or those of a friendly nation may not involve long distances, but, in view of the length of, say, the European coastline, it might very well. Such an operation would probably not face threats other than mines, but transit speed could be important, as a prolonged mine threat in home or allied waters is likely to cause significant economic damage.

An additional task that falls into this scenario is route survey. Some countries survey routes in their territorial waters periodically; the detailed knowledge of the environment offers the basis for speedy MCM if the need arises. Required assets are derived from the routes to be covered and the nationally defined repetition of coverage. France and the United Kingdom put special emphasis on the approaches to their nuclear submarine bases. This requirement would seem unique to those two countries, but is it really? Arguably all nations have interests in keeping open the approaches to their naval bases and commercial harbors.

Postconflict clearance would be conducted in the same waters as expeditionary operations—again, possibly far from home waters but this time without other threats but with an enduring nature. Clearance after the 1991 Gulf war took the mine-countermeasures forces of a large number of NATO member states almost

two years to complete. Operation "ALLIED HARVEST" in 1999 can be seen as a variant of this type of employment; its task was to clear the Adriatic seabed of ammunition dropped by aircraft returning from strikes in Yugoslavia during Operation "ALLIED FORCE" prior to landing on their carriers. Clearing historical ordnance in local waters also falls into this category. Considering the number of mines laid during both world wars and the ammunition dumped into the sea after them and during the Cold War, it has to be assumed that the task of removing them will remain with European navies for years, maybe even decades.

CAN LEGACY SYSTEMS COPE WITH THE SCENARIOS?

The current MCM capability in Europe is provided mainly by purpose-built, dedicated vessels.[11] They are highly specialized and costly in relation to the overall capability they provide to a fleet. It is common knowledge not only in the MCM community that these vessels, being small, have significant restrictions. The systems now in use with European NATO navies were planned and built around the end of the Cold War. They were designed for individual or combined mine countermeasures (e.g., hunting/sweeping) in homeland-defense scenarios. Seaworthiness, endurance, and interactions with other types of naval vessels did not play significant roles in their designs. But numbers did—the navies of Belgium, France, Germany, Britain, and the Netherlands alone had 152 MCM vessels in their combined order of battle in 1990.[12] That number has since been substantially reduced. By 2012 it had dropped to just fifty-two, and further reductions are not unlikely.

The existing platforms have top speeds ranging from twelve to eighteen knots, transit speeds between ten and sixteen knots, and crews of around forty. Their range, seaworthiness, self-defense, sustainability, and ability to share information with task forces all must be labeled minimal at best. They are able to operate only from three to seven days before resting their crews and resupplying. They have in the past deployed to distant locations—the Arabian Gulf, the U.S. East Coast (distant with respect to European nations), and the Black Sea—but they took weeks to get there. Weather slows their transit even more and could prevent their employment once on station from progressing past an early stage. Operations off hostile coasts must be seen as problematic. These ships would not be able to deploy, communicate, or exchange information with a task force or to defend themselves. They would need, therefore, dedicated support and command ships, as well as protection by more capable warships. This protection has been attempted using a "babysitter" tactic, assigning frigates and destroyers to protect an MCM force, but the approach never accomplished much, and with the number of frigates and destroyers dropping as well, it must be questioned whether commanders will be willing to assign any to look after MCM vessels.

The current capability is sufficient for what it was designed for—homeland defense and, to some extent, postconflict clearance. But even for those tasks, numbers are now of concern. The reductions to date have brought force levels so low as to multiply the time needed to clear given areas. Any losses would have a much higher impact than in the past. As the Royal Navy has declared, "In the future, until sea control has been assured to an acceptable level of risk, the contested littoral will remain no place for mission-essential units."[13] But it is unclear today what a "mission essential" unit is—given such small numbers, all units may have to be seen as mission essential.

How can the shortfalls in this crucial capability be mitigated? Upgrading legacy systems is not the ultimate solution, because of their small size; there is simply no space left. They must, then, be replaced—but with what? British doctrine lays down that "the ability to conduct war-fighting under-writes the ability to deliver maritime security and international engagement and this role has primacy."[14] This clear statement points to the three scenarios that must be weighted in importance. Having three different types of platform for the three scenarios is out of the question (as will be seen below). Requirements should be derived for the most demanding scenario and then checked against the others. The replacement should be able to cope with these scenarios and correct the deficiencies of legacy platforms. A design is needed that can act in what is called the "contested littoral." As it will never be expendable, it will need a degree of survivability and self-defense capability. It must have "longer legs" than today's vessels and be more seaworthy—and accordingly, perhaps, bigger. The main reasons to keep the vessel as small as possible, however, are cost, manning, and the (controversial, as we will see) need for signature reduction. It should also be faster and able to carry, launch, and recover unmanned vehicles in significantly higher sea states than is possible today.

COST AS A FACTOR

"Defense wears a dollar sign."[15] Owing to this fact and ongoing economic difficulties, austerity measures can be seen in most Western armed forces. Their militaries are no longer in the public focus; people concentrate on social, education, and health issues. These influences are forcing states to reduce numbers in personnel and equipment. It is doubtful whether a single-role platform is affordable; any larger and more capable MCM platform would have to be usable for other tasks as well. Some navies are doing this already. Consideration must be given to making vessels primarily intended for other purposes able to carry MCM modules, as some navies are planning to do. Intensive dialogue will be needed with the surface community to define what this "designated," as opposed to dedicated, vessel will be able to do and when a dedicated MCM force will be needed. A platform

that carries a mine-countermeasures capability might find itself tactically tied to MCM tasks at the expense of other tasks. A balance is needed.

Procurement and life-cycle cost (LCC) must be kept in mind. Roughly 70 percent of a ship's overall costs are incurred after construction; its drivers are operation, modernization, and people.[16] Modularity and reduced manning offer savings. The speed of a platform depends very much on the money that can be spent. Size, level of protection, endurance, and range impact cost. The same is true for the degree of integration of systems. While a dedicated platform should have a high level of integration, a designated platform could instead need modular control stations for added modules. One of the main cost drivers is the size of the complement. Crews need to be recruited, trained, fed, paid, and also accommodated at an acceptable standard, to keep service on board naval ships attractive. It will be absolutely essential during development to distinguish clearly between "need to have" and "nice to have." As the British observe, "With procurement timescales stretching into decades, and life spans of platforms being thirty years or more, adaptability must be found primarily within the people and systems which operate in, and from, the platform."[17]

There is a clear need to plan for spare room for additional capability in the future, as this might not be possible to achieve by just replacing old equipment with new. Easing modernization is an argument for building modularly (about which more below). A module can be taken off and replaced by a new one much more easily and cheaply than a fixed system can be replaced or a new one fitted.

Operating and maintenance costs must be considered too. To drive down operating costs, alternative propulsion should be considered. Diesel engines may not be the most efficient way of driving a ship today. Fuel cells are a possibility; they are being used in submarines with substantial success. Using material other than steel could drive down maintenance costs. Systems should be designed aiming at minimum maintenance; this will reduce the workload of the crew and thus its size. Again, a balance has to be found, or reduction in maintenance and operating costs will drive up those of procurement.

Another consideration is a country's need for its navy to operate in the Arctic. Norway may have a very different view on this than, for instance, Italy. The need to operate in the demanding environment of the very cold Arctic waters will impose special requirements on both modules and platform. By the same token, very warm waters, such as in the Arabian Gulf, are also challenging, for systems and ships alike. Ability to operate in both areas would be desirable, as it offers options to decision makers, but it also drives cost up. Trade-offs will become a necessity, just as in all other areas—the "nice to have" is likely to be unaffordable.

Factors driving the size of the platform—such as the number and size of modules—need to be examined at this stage. Those choices, in turn, are influenced by

how a navy defines missions and the systems required for them. The European Defence Agency (EDA) has also started to address the question. There is talk of "MCM mission packages" as comprising mine-countermeasures, command-and-control, and launch-and-recovery (L&R) systems, a team of operators, and divers. An MCM vessel itself—what the planners of the U.S. Littoral Combat Ship called a "seaframe"—plus the mission package would, then, form a specialized MCM capability.

As far as numbers are concerned, the EDA envisions a future dedicated MCM vessel to be able to carry and operate something around five modules. A designated platform would support a given mission by embarking one or two modules. Further contribution could be provided by land-based systems. Interoperability with legacy MCM vessels is considered a definite requirement.[18]

Finally, the *Common Staff Requirements* of the EDA states the new MCM vessel's possible standoff distance (i.e., from the mined area) as being from twenty-five to thirty nautical miles.[19] These values might have to be revisited. They could be significant cost drivers and put pressure on technological solutions. They might contradict the stated need to use mature technologies.

MODULARITY: THE WAY OUT OF TROUBLE?

It becomes clearer what a follow-on platform may have to be capable of. But the need to keep cost low makes trade-offs necessary. Without austerity it would no doubt be possible to develop a system that fulfills all requirements and could be built, manned, and worked up in sufficient numbers. As conditions are, modularity may offer cost-saving options and offer a wider range of employment. As an Australian analyst has observed, "A significant amount of research has been undertaken in the field of modularization of naval vessel capabilities, which potentially offers significant procurement and operational cost benefits to owners and operators as well as increased fleet flexibilities."[20] But it may have disadvantages. Training and crew integration are just two issues. It is also well understood today that a system meant to be able to do everything can, in the end, do nothing satisfactorily. So it seems that there are limitations to modularity.

Modularity can be approached in various ways and to various extents, as categorized by the Australian analysis just cited. "Type I" concerns modular containers or other modular installations (modular "plug and play" space) involving minimal installation time. "Type II" differs in that it requires significant installation time. Finally, "Type III" provides modular space for capability-specific equipment.[21]

Another distinction is between construction and mission modularity. There are a number of existing modular designs and concepts. For example, the Royal

Danish Navy uses the Stanflex concept, the German shipyard Blohm & Voss has developed the "Mehrzweck Kombination" (MEKO) design, and Abeking & Rasmussen (A&R), another German shipyard, offers the Modular Platform Concept (MOPCO).[22] Stanflex, dating back to the 1980s, replaced twenty-two aging, small warships with a purpose-built modularized capability, with modules interchangeable between vessels. This concept, which used common platforms across multiple capabilities and thus cuts LCC, has been developed further and applied fleet-wide. The MEKO concept, the most widely employed in ship design and construction, utilizes a standard platform and offers variable, customized levels of outfitting, to be chosen by the customer. It allows for significant savings in production costs. MOPCO puts together the above approaches, combining common systems into larger task modules. These modules contain all equipment required for a given capability.

A conceptual design for a forty-five-meter "small-waterplane-area twin hull" (SWATH) platform has been published. Its primary task is MCM; it comprises MCM, accommodation, and ship-control modules. Reconfiguration to other missions is achieved by complete replacement of the MCM module.[23] Thyssen Krupp Marine Systems (TKMS) has taken development further, with the MEKO-Fusion project. This envisages interchangeable use of mission modules housed in twenty-foot ISO Type 1c containers, underscoring an emphasis on speedy role change. In the basic version it would carry out constabulary tasks, but it could, by adding other sensors and effectors such as radars, sonars, and weapons, change roles and assume war-fighting tasks, MCM among them. The mission modules incorporate existing naval systems, such as BAE System's 57 mm gun and Saab's RBS 15 missile. The initial eighty-four-meter, 1,500-ton, all-composite ship has some resemblance to the Kockums *Visby*-class corvette. Its "extreme delta" hull will have some advantages over a conventional fast monohull. The speed of the suggested design would be above forty knots but could be reduced (to save cost) by reducing installed power. The hull shape offers a wide stern with space for mission modules and L&R systems.[24]

As suggested above, modular design has significant benefits but also disadvantages and risks.[25] A risk is that it may be impossible to provide sufficient numbers of trained crew to allow full utilization of modular capability. There is also a chance of in-service failure due to increased system complexity and the use of unproven technologies. The main inherent disadvantages area size generally larger than would be required for a role-specific platform, meaning less efficiency with respect to each role; the need for trade-offs in order to serve all planned roles; and complications in combining systems that could lead to increases in weight, complexity, and cost.

The benefits are possible LCC savings (at the price, as noted, of efficiency), resulting from a high degree of commonality for stores and maintenance, increased flexibility, reduced off-task times and redundancy, and fleet-wide applications of modular technology. A common platform that utilizes modular capability offers the possibility of concentrating on one use in times of need; for example, all ships could be configured for MCM if an imminent threat requires maximum attention. Modularity, as suggested above, makes modernizing a ship much easier; if the platform is simply a "truck" carrying mission systems, modernization can be achieved by changing the load of the "truck." Further savings can be found in managing the number of modules procured; ships in workup or other nonoperational phases of their employment cycle would not need a full outfit. Shore-based versions of modules, or modules not needed at a given time by deployed ships, could be used for training.

CURRENT DEVELOPMENTS

An overview of concepts currently under consideration or being developed will give an idea of the general movement toward the use of modular systems. First, let us look at how the U.S. Navy, the unquestioned leader in modern naval technology, is tackling the problem. The United States has stated an aim of overcoming antiaccess strategies.[26] Doing so is seen as a preparation to defeat adversaries and to operate in all domains. To that end, and to carry mine countermeasures into the future, a replacement is planned for the legacy *Avenger* class, the Littoral Combat Ship (LCS).

LCS is a totally mission-modular concept. The platform will be reconfigurable any place in the world and can assume various roles, one of them MCM. There are currently two versions; both can reach speeds well over forty knots. USS *Freedom* (LCS 1), designed and built by Lockheed Martin, has a high-speed, semiplaning monohull 115.5 meters long and a full-load displacement of three thousand tons. USS *Independence* (LCS 2), designed and built by General Dynamics, has a trimaran stabilized aluminum hull 127.8 meters long and a full-load displacement of 2,637 tons.[27] Both have core complements of around forty. Mission crews will come on board with any of the planned twenty-four MCM mission packages. LCS will carry and employ a variety of off-board sensors and effectors. The U.S. Navy has clearly defined "mission systems" as vehicles, sensors, and weapons; "mission modules" as mission systems plus support equipment; and a "mission package" as mission modules plus mission crew detachments, plus aircraft.[28] In the MCM role, LCS is supposed to remain outside the minefield; it is therefore not protected against mines like the legacy ships it replaces. LCSs are planned to operate in groups, assisting each other.

LCS is seen to have revolutionized current approaches to acquisition, operation, and modernization. It is referred to as the first platform to be designed with modernization in mind. Industry was allowed to produce ideas under research-and-development funding.[29] But LCS is also under constant criticism, for a variety of reasons. One is that LCS will not cover all scenarios. Like the once-planned "craft of opportunity" MCM program, it aims solely at the expeditionary role: "The sea is a maneuver area. From the U.S. Navy's perspective, the goal of MCM is to enable maneuver of naval forces, not to counter every mine."[30] So there may be a requirement to cover a gap, the clearing of broad areas after the initial "punch through." Having ships operate in groups in the contested littoral environment has the clear advantage of maintaining a large degree of capability in the event of losing a platform. But the variety of possible roles comes at a considerable price, and the group concept requires numbers. Smaller navies might not be able to embark on a similar project. Here cooperation could provide a practicable option, as the members of groups do not need to come from one country (see NATO's Standing Naval MCM Groups).

In Europe, France and the United Kingdom have agreed on extended military cooperation, in their 2010 Lancaster House treaties. One observer has noted, "The Royal Navy has already begun collaborating with France on an MCM equipment module for whatever the new vessels turn out to be."[31] Both nations did some work on the problem; they have slightly different approaches but share a common baseline. Research has been extremely complicated, as information cannot easily be found in open sources and agencies in the United Kingdom have been unwilling or, for classification reasons, unable to assist the author. So the depth of the analysis in this section is limited.

In the United Kingdom, the 2010 Strategic Defense and Security Review confirmed the need to replace the current fleet of MCM vessels; it points in a direction similar to LCS but not to the same degree of modularity. Both France and the United Kingdom have started demonstrator trials. Britain is following a "twin-track approach."[32] The Royal Navy has recognized the need to ensure the maturity of the new systems before making the leap to a new class, in order not to be left with capability gaps. What is needed is a proven "system of systems," able to provide end-to-end surveillance, minesweeping, and mine disposal.[33] The result is a phased approach, proving first the off-board capability, then the ability to perform the mission from outside the minefield. This means that the systems and the platform can be developed independently.

There seems to be considerable doubt that the "man out of the minefield" principle can be applied in toto. The skills provided by clearance divers may still be required. The future end state has been described as a "trinity of capability"

also known as "portable, organic and dedicated."[34] However, over the past years some experience has been gained with the operation of autonomous underwater vehicles (AUVs). A further step will be taken with "flexible agile sweeping technology" (FAST), involving an unmanned surface vehicle (USV) capable of remotely controlled minesweeping and possibly mine-hunting tasks. It can be employed from the current Hunt class. In addition, unmanned aerial vehicles (UAVs) may have roles in surveillance, detection of near-surface mines, and communication relay over the horizon.

The aim is to develop and mature a capability that covers areas ranging from harbors or confined waters to the very-shallow-water region, and to the deep sea. The United Kingdom's plan is to design a common hull that can carry out MCM, hydrographic, and patrol tasks—a Mine Countermeasure, Hydrography, and Patrol Capability (MHPC). Mine countermeasures and hydrography have common requirements to map the seabed and analyze the environment. The patrol capability will be inherent in the platform.

A possible answer is the BMT Venator project.[35] With a length of just over ninety-three meters and displacement just above three thousand tons, this proposed vessel would be significantly larger than legacy ships, providing it more seaworthiness, speed, range, and endurance. It is planned to be able to travel with a task force at eighteen knots in sea state 6 and to have a sprint speed of twenty-five knots.[36] (High speed is not a requirement in the Royal Navy.) It would be operated by a core crew of forty but would have accommodations for up to eighty. The design offers a payload capability of seven hundred tons.[37] It would carry mainly autonomous underwater and surface vehicles to hunt and sweep mines. The ship itself would remain outside the minefield, a fact that reduces its cost.

The need for a highly specialized platform may be decreasing, but whether it has disappeared completely remains doubtful. Detailed research has shown that a ninety-meter monohull design with a flight deck and "garage space" below it (in which to store vehicles and from which to deliver them over a stern ramp) would be optimal. It could be manned by a crew of eighty, including embarked personnel. It would host UAVs and provide shelter in a retractable hangar for a Lynx-sized helicopter. Such an approach, at least in some ways, would be the *Black Swan*–class sloop of war.[38] This platform would have a displacement of 3,150 tons, a length of ninety-five meters, a top speed of eighteen knots, and a complement of forty. Both *Black Swan* and BMT Venator rely on keeping "the man out of the minefield."

The Royal Australian Navy is developing a similar concept, called the Offshore Combatant Vessel (OCV), or Project Sea 1180.[39] It envisions a single class of modular, multirole offshore combatants conducting the tasks of four existing role-specific types: patrol boats, MCM vessels, hydrographic survey ships, and

oceanographic/environmental assessment vessels.[40] It is based on an aluminum-alloy trimaran developed by Austal, the MRV 80. The design is eighty meters long and displaces roughly two thousand tons. Top speed is to be twenty-six knots, and a complement of up to eighty-seven personnel is planned. It includes a flight deck and a storage space below it for mission modules. It will not be able to operate inside a minefield.

The French Navy plans to develop in parallel a full capability and also a portable capability. The full capability will be based on a host platform that stands off the mine-danger area.[41] USVs will transport mine-hunting systems able to perform the detect-to-countermine sequence into the minefield. The USVs can be operated either by the new dedicated platform being planned or by (in the "portable capability" variant) a *Mistral*-class amphibious assault ship. The dedicated platform will be designed and constructed by DCNS. It is likely to be a hundred-meter-long SWATH hull of between two and three thousand tons;[42] however, there are catamaran and monohull designs (Gowind-OPV) under consideration as well. All variants would feature a flight deck and a stern ramp for launch and recovery of boats, USVs, and AUVs. None would be built to low-signature standards; all therefore would have to remain outside the minefield. There will be an interface with the seventeen-meter ESPADON USV, which is undergoing tests.[43] The ESPADON displaces twenty-five tons and is intended mainly to transport large AUVs and one-shot mine destructors.

The Royal Swedish Navy is considering a concept based on Kockums' FLEXpatrol MCM.[44] The concept comprises a corvette-sized vessel capable of transporting modular manned and unmanned off-board equipment for patrol, hydrographic, and MCM tasks. These modules would be added to permanently installed equipment that would form the baseline of operation, protection, and communications. The idea is to have a flight deck and beneath it a "garage" with stern ramp to deploy and recover boats, AUVs, and USVs. The concept goes beyond tying the modules to the platform—it speaks of MCM as a "toolbox." The modules, which consist of the vehicle and a control station, can be employed on other vessels, such as the *Visby*-class corvette, or ashore. The FLEX platform itself will be roughly eighty meters long, with a displacement of a thousand tons plus. Its endurance is to be between twenty and thirty days, its range between three and four thousand miles, and its speed twenty to twenty-five knots. A carbon-fiber hull design reduces underwater signature, weight, and maintenance (80 percent less than for a steel hull), and it enhances shock resistance and stealth. The concept is seen as a complement to both organic and designated MCM: the organic capability of the *Visby*-class corvette would "punch through" a minefield, and FLEX, able to operate inside a minefield, would clear the area.

Abeking & Rasmussen has developed a concept based on a number of small units. The vessel is derived from a demonstrator the German Navy has used for a "Mine Hunting 2000" project. It is a SWATH design just over twenty-eight meters long, with a displacement of 140 tons and a speed of approximately twenty-one knots. SWATH is known for seaworthiness. Because crew size is one of the main cost drivers, A&R has kept the crew to the very minimum, eight. Latvia has procured some of these vessels with mission modules for patrol and MCM. All modules are based on twenty-foot containers. A&R argues that having a number of small vessels operating modular equipment has the advantage of resilience compared with one large, integrated platform, in case of losses.[45] A large "mother" dock-type ship could transport the small vessels and so mitigate their lack of endurance and range.

The European Defence Agency runs a project—Maritime Mine Counter Measures Next Generation, or MMCM NG. Its cornerstones are rapid MCM; security, flexibility, and modularity; decreased logistical dependence, maintenance, and LCC; and higher MCM capability (with fewer units and people) and deployment speed.[46] The project is led by Germany; other participating countries are Belgium, France, Netherlands, Sweden, and Estonia. Norway, although not a member of the European Union (EU), is also involved. The initial workshop took place in Brussels in February 2013. Directly connected is a research and technology program known as European Unmanned Maritime Systems for Mine-Counter-Measures and Other Naval Applications.[47]

The MMCM NG project was one of twelve selected by the EDA steering board in 2008. The twelve constitute the EDA's Initial Capability Development Plan and contribute to long-term capability development within the European Security and Defense Policy. The goal is to introduce a new generation of MCM able to counter threats from old mines to the most advanced ones in a more effective and safe way than at present. The agency appears to be on a promising track, as the initiative offers a path toward the EU's "pooling and sharing" of capability. This would also be in line with NATO's "smart defense" principle. Both EU and EDA see this program as a promising way ahead, inasmuch as nations are feeling more and more constrained in their abilities to acquire missing capabilities on their own. Small numbers and rising costs are driving total costs further. That is even more true of unique equipment, although life-cycle costs are getting higher than those of acquisition.

A corvette-sized vessel seems to be the answer. It is small enough to reduce its signatures to allow it to enter a minefield. It is large enough to provide space for a number of AUVs and USVs and to be comparatively seaworthy. It would also

provide the baseline requirements for range and sustainability. Manning could be kept at a minimum through a high degree of ship-systems automation and alternative operational approaches. The sizes of the AUV and (mainly) USVs would be limited, but the FAST system could well be transported on and employed from such a platform.

The degree of mission automation is another factor to be considered. Should a drone have the capability to decide to fire a weapon? Is a human needed to make this decision? A future large AUV could carry mine-disposal weapons and fire them on the basis of a computerized assessment; a networked group of USVs or a single vehicle could be so advanced as to identify a mine, assign a disposal weapon, and fire it, all automatically. The advantages of the vehicle acting autonomously to such an extent can be seen in covert operations and over-the-horizon employment. However, national views on this issue vary. Some nations seem to have no concern over automated firing; others see it as a "red line."

Mission bays are included in most proposals, and there seems to be agreement that stern ramps are the best way to launch and recover off-board systems. The combination of mission bay and stern ramp has been investigated by the Babcock Marine and Technology Division, initially for the Royal Navy's new Type 26 frigate project.[48] Innovative ways of moving equipment inside the bay, such as rail systems in the deck or overhead, would enable handling in sea states up to 6. More controversial is the use of standard twenty-foot containers as a baseline for modules. While some concepts rely heavily on it, others would prefer a smaller standard. All concepts include flight decks for UAVs and helicopters; some have a form hangar, for medium-sized helicopters. All proposals envision fixed, installed equipment for self-defense, communication suites, and surveillance. These may constitute a patrol and maritime-security operations (MSO) capability.

Displacements vary from around a thousand tons to over three thousand. In Europe there seems to be a common understanding that speed above twenty-five knots is not required. This again limits cost, as higher speed requires additional power, a significant cost driver. The U.S. Navy's LCS and the TKMS project are clear exceptions here. Core crew sizes are mostly around forty; that is the current level, but the assumption is that future crews would be operating more systems. The projects have space for additional personnel. Range and endurance are greatly enhanced across the board, which could make specialized command and support platforms unnecessary.

Finally, the concepts generally concentrate on MCM, hydrography, and patrol tasks. Intelligence gathering is mentioned only in some of the EDA project briefs. There would clearly be a possibility of embarking such a capability in any such platform.

KEEP THE MAN OUT OF THE MINEFIELD?

Reliance on autonomous robotic systems deployed from standoff vessels, possibly over the horizon, would mean a total change in the conduct and culture of MCM and is not to be undertaken lightly. Can it be done? Can off-board sensors and effectors provide sufficient knowledge of the seabed? If the technology is mature enough to be trusted with the lives of seamen, there might be potential in the concept. The United States is, and the United Kingdom and France appear to be, convinced that it is mature enough; some members of the EDA project apparently differ. But there are more central questions: How certainly can the boundaries of a minefield be determined? How far must the seaframe stay from an area that is believed to be mined, not to risk entering it accidentally? What level of risk is acceptable? Standoff ranges and reliability must be considered as cost-driving factors, albeit with a potential for savings if signature reduction is achieved.

It may prove that keeping men out of minefields is not achievable and that platforms that can operate inside them are required. In that case drones may have to be developed—which might well be too large for platforms that need to be small to minimize their signatures. But even if it is achievable, fundamental issues arise, such as when the mother ship cannot avoid entering the minefield. Information about the field's boundaries, or about the mine threat itself, might be insufficient; the size of the minable area might exceed the range of the off-board systems; or the enemy might know about the concept and mine the mother ship's approach route.

Beyond these technological and operational factors, national ambitions may prove decisive. For instance, it might be possible to "punch through" a minefield, by the U.S. approach, without putting men into it, but other nations need the capability to clear larger areas. Does a country need deployable forces? For homeland defense only, the current platforms or modules operated from shore might be sufficient. For expeditionary roles, a platform that can survive in contested environments is needed, though the MCM modules might be the same.

In any case, as *Jane's* argues, "new MCM technologies need to be de-risked and new systems proven before the MCM community embraces standoff systems."[49] Meanwhile, the current systems—despite the limitations already noted—will remain in use for some years to come, and some navies have started to integrate new capabilities into them. This might prove the optimal way of "de-risking" standoff systems, determining how practicable "keeping the man out of the minefield" is and ensuring a smooth transition from legacy to new systems. But as we have seen, even mature technology does not guarantee success. The aim may stay an aim.

CREW CONCEPTS

Finally, manning must be considered in depth. There is a clear incentive—cost—to reduce crew size. A three-watch rotation for all stations prevents early crew fatigue but requires more personnel than the two-watch system that most legacy vehicles use. For ships that carry different modules for different missions, there are many options, each with pros and cons. One principle envisions a "core crew" for the ship and "mission crews" for the modules. This raises the problem of crew integration, especially with the minimal manning needed to reduce LCC. The two parts of the crew will have to work up to fight together, and in small ships, some tasks, such as damage control, are always "all hands." It would be possible to equip, work up, and deploy the ship with certain modules and leave it that way for a considerable time; this integrates the crew but limits the modularity. Another option is to train one crew to use different modules. This again would ensure an integrated crew, but it would significantly lengthen training time (but maybe not training cost, as the training will have to be provided in any case). Refreshers prior to module and task changes might become necessary, limiting flexibility, or at least the speed with which roles can be changed.

A balance will have to be found between modularity and other cost-driving factors. Limiting modularity to some degree might be a satisfactory trade-off. In a dedicated platform, some capabilities could be integrated permanently—for instance, as noted above, self-defense and communication suites will be needed for almost all missions.

Promising approaches are available. But significant questions remain for further investigation. Of these, the issue of whether humans can realistically be kept out of the minefield appears to be a very important, if not the central, question. But there are others: Is technology mature enough to allow a leap in MCM philosophy to a possible next generation of capability? What are the implications for training, doctrine, and procedures?

The solution might be a tiered approach. If expeditionary-focused navies set themselves up for the "punch through" capability for which the United States has opted others may be needed for the challenging task of clearing larger areas, a task in which numbers will play an important role. There seems to be a drive toward a larger, more capable platform with space for future growth, but unit protection by signature reduction remains controversial. If it is needed, it will restrict the size of the vessel and the number and size of systems it can carry. The final result may have to be a compromise.

It seems to be the common view that a platform providing MCM capability alone is not feasible. However, the argument that a platform engaged in MCM

will be very restricted in performing other tasks is widely accepted; a ship launching and recovering unmanned systems will not be able to do much else. The requirement for a hydrographical capability varies, that not being a naval task in all countries. Patrol, in contrast, seems to be considered a given with any capable platform.

The need for a smooth transition from the current capability to the next generation is commonly acknowledged. It can be achieved by mitigating technological risk through maturing new systems on legacy platforms. Indeed, there seems to be agreement on the idea of MCM systems as the driving part of development and the platform as the enabling part. Also commonly accepted are stern ramps and flight decks.

But the question remains of how long the step to the next generation will be. The answer will be shaped—as the numerous approaches are investigated and, potentially, new ones are discovered—by national purposes, financial ability, political will, and readiness to cooperate.

NOTES

1. European Defence Agency, "Future Concept on Maritime Mine Countermeasures: A Capability Approach," draft, May 2013, p. 5.
2. Cdr. Mark Atkinson, quoted in Richard Scott, "Standing Off a Step at a Time," *IHS Jane's Navy International,* 25 August 2011, p. 3.
3. Adm. Jonathan Greenert, "Navy 2025: Forward Warfighters," U.S. Naval Institute *Proceedings,* 18 December 2011, p. 21.
4. Scott C. Truver, "Taking Mines Seriously," *Naval War College Review* 65, no. 2 (Spring 2012), p. 30.
5. Adm. Gary Roughead, USN, Chief of Naval Operations, statement before the Congressional Mine Warfare Caucus, 10 June 2009.
6. "IEDs: The Poor Man's Artillery," *The Week,* 12 February 2009, theweek.com/.
7. Truver, "Taking Mines Seriously," p. 31.
8. Ibid., p. 32, quoting Ambassador Chas (Charles W.) Freeman.
9. Colin S. Gray, "Strategic Thoughts for Defence Planners," *Survival* 52, no. 3 (June–July 2010), p. 162.
10. "Libya Conflict: Clearing Mines at Misrata Port," *BBC News,* www.bbc.co.uk/.
11. Stephen Saunders, *Jane's Fighting Ships, 2012–2013* (Coulsdon, Surrey, U.K.: IHS Jane's, 2012).
12. German Ministry of Defense [hereafter DEU MOD] (presentation, Initial European Defence Agency [hereafter EDA] Workshop, Brussels, 7 February 2013).
13. *Future "Black Swan" Class Sloop-of-War: A Group System,* Joint Concept Note 1/12 (Shrivenham, U.K.: Development, Concepts and Doctrine Centre, May 2012) [hereafter JCN 1/12], p. 1-14.
14. U.K. Ministry of Defence, *British Maritime Doctrine,* Joint Doctrine Publication 0-10 (Shrivenham, U.K.: Development, Concepts and Doctrine Centre), para. 219.
15. This is the title of chapter 10 of Bernard Brodie, *Strategy in the Missile Age* (Princeton, N.J.: Princeton Univ. Press, 1959).
16. Nevin Carr, "Opinion: LCS: The US Navy's 'Disruptive' Warship," *Jane's Defence Weekly,* 20 February 2013.
17. JCN 1/12, p. 2-2.
18. DEU MOD, presentation.
19. EDA, *Common Staff Requirements (CSR) for Future Maritime Mine Countermeasure*

Capabilities, EDA COM 067-2012 ARM (Ixelles, Brussels, 2012), annex.

20. Jordan Glanville, *Capability Analysis of Multi-role Warships for Australia* (Melbourne, Austral.: BMT Design & Technology), p. 1.
21. Ibid., p. 4.
22. *Mehrzweck Kombination* is German for "multipurpose combination."
23. Glanville, *Capability Analysis of Multi-role Warships for Australia,* p. 3.
24. Alex Pape, "TKMS Unveils New Reconfigurable Patrol Ship," *International Defence Review,* 13 July 2007.
25. Glanville, *Capability Analysis of Multi-role Warships for Australia,* p. 5.
26. U.S. Defense Dept., *Quadrennial Defense Review Report* (Washington, D.C.: February 2010), and *The National Military Strategy of the United States of America* (Washington, D.C.: Joint Staff, February 2011).
27. Liam Stocker, "Combat Ships Do Battle: LCS versus Type 26," Naval-technology.com, 29 August 2012, www.naval-technology.com/.
28. "United States Navy Fact File, Littoral Combat Ships: Mine Countermeasures (MCM) Mission Package," Naval Systems Command, Washington, D.C., 25 October 2012.
29. Carr, "Opinion: LCS: The US Navy's 'Disruptive' Warship."
30. Truver, "Taking Mines Seriously," p. 47.
31. Nick Childs, *Britain's Future Navy* (Barnsley, U.K.: Pen & Sword Books, 2012), pp. 134–35.
32. Scott, "Standing Off a Step at a Time," p. 1.
33. Ibid., p. 3.
34. For the "trinity of capability," ibid., p. 5.
35. "Surface Combatants," *Warship Technology,* January 2008.
36. "Venator Provides Framework for a Reconfigurable Warship," *Warship Technology,* January 2008, p. 33; "The Globally Deployable Minor Warship: A Conceptualisation of Future Solutions" (presentation, INEC 2008, Hamburg, Ger.).
37. "Future Force 2020: Royal Navy," *UK Armed Forces Commentary* (blog) ukarmedforcescommentary.blogspot.co.uk/.
38. JCN 1/12.
39. Royal Australian Navy Capability Development Group, *Offshore Combatant Vessel (OCV) Initial Capability Description* (Canberra, ACT: July 2011).
40. Glanville, *Capability Analysis of Multi-role Warships for Australia,* p. 1.
41. "France Details ESPADON Progress," *International Defence Review,* 22 October 2012.
42. "Vehicles: Untethered Vehicles—Unmanned Surface Vessels (USVs), France," *JUMV,* 26 November 2012.
43. *Évaluation de Solutions Potentielles d'Automatisation de Déminage pour les Opérations Navales,* or Evaluation of Potential Automation Solutions for Mine Clearance in Naval Operations.
44. Briefing by Kockums representative to DEU MOD on MMCM 2020+, 12 March 2013.
45. Abeking & Rasmussen brief to DEU MOD, 12 March 2013.
46. DEU MOD, presentation.
47. EDA, *Common Staff Requirements (CSR) for Future Maritime Mine Countermeasure Capabilities.*
48. Richard Scott, "Mission Bay Studies Examine Modular Approaches," *International Defence Review,* 20 June 2011.
49. Jane's Naval International, "Counter Culture: Removing the Man from the Minefield," posted 23 April 2010, sources.esis.intra.corp/.

BOOK REVIEWS

DUTY: A REVIEW AND COMMENTARY

Gates, Robert M. *Duty: Memoirs of a Secretary at War.* Newburyport, Mass.: Knopf, 2014. 640pp. $25

The title of *Duty* could easily be *So You Want to Be the Secretary of War, Violence, and Suffering?* Gates's memoir takes the glamour out of the position and makes sure the reader grasps just how personally draining and ethically frustrating the job can be. It is a book worth reading, if only to learn more about the scope of the issues that typically face any conscientious Secretary of Defense.

To bring that point home, here are the more important challenges and issues that Gates had to deal with across two presidential administrations: scaling back the U.S. military presence in Iraq; scaling up that same presence in Afghanistan; defending two controversial war policies before an often hostile Congress; taking care of military personnel injured in Iraq and Afghanistan; explaining to families of those killed in both wars why their deaths mattered; building personal relationships with counterparts in other governments; dampening the negative effects of "turf wars" between White House staff and officials (both uniformed and civilian) in the Defense Department; sponsoring the development of antimine vehicles that the career acquisition people in the Army did not want; tailoring the organization of U.S. and allied forces in Afghanistan; fostering an organizational climate that would allow the military services to move beyond "don't ask, don't tell"; and serving as a trusted adviser to two very different presidents from opposing political parties.

I find the list daunting. Robert Gates too found it daunting, but he took on those challenges and issues with energy, patience, persistence, and loyalty to the Republic. *Duty* is just the right title for his memoir. It is what Gates swore to do, and his memoir is an effort to describe his role and the role of other actors in some very crucial events.

The comments I have already read about the book focus on Gates's critical opinions of important personalities, including Presidents George W. Bush and Barack Obama, former Secretary of State Hillary Clinton, and several senior military officers. If those criticisms are all one comes away with after reading this book, the more important stories told by Gates have been unfortunately missed. If you read the entire book, you can step back and say, "Two

presidents gambled by committing the United States to two different wars, and both presidents needed someone to come along and 'fix things' when those two bets didn't play out as the presidents expected and hoped." Gates was "the fixer"—dedicated, a hard worker, disciplined, organized, experienced, well connected, and intelligent.

Gates was not in on the planning for the war against Iraq. As he says on page 568, "Had I been secretary of defense during the winter of 2002–2003, I don't know whether I would have recommended that President Bush invade Iraq." However, Gates does not second-guess President Bush: "It would be disingenuous to say with ten years' hindsight that I would have been opposed, especially since I publicly supported the decision at the time." Moreover, after citing all the negative aspects of the war against Iraq, Gates says, "I cannot honestly claim I would have foreseen any or all of that." In any case, when he took over from Donald Rumsfeld, he set aside his own personal concerns and embarked on a campaign to support President Bush. Gates agreed with former Secretary of Defense William Perry that "the consequences of failure in Iraq would be catastrophic—much more consequential than failure in Vietnam." As Gates argues, "A defeat of the U.S. military and an Iraqi descent into a vicious civil war that likely would engage other countries in the region would be disastrous, destabilizing the region and dramatically boosting Iran's power and prestige."

As President Bush's Secretary of Defense, Gates had three goals with regard to Iraq: defend Bush's decision in late 2006 (even before Gates became Defense Secretary) to "surge" U.S. forces into Iraq, thereby allowing the troops time to achieve the president's goals; maximize "the possibility of keeping a substantial number of troops in Iraq for years to come"; and establish "a long-term security and strategic relationship with Iraq." It was imperative to "avoid even the appearance of American failure or defeat in Iraq."

In pursuit of these goals, Gates had to support U.S. commanders in Iraq, especially General David Petraeus, and to "buy time" in Washington for the surge to take effect. Gates puts it this way: "There was a Washington 'clock' and a Baghdad 'clock,' and the two moved at very different speeds. Our forces needed time . . . , but much of Congress, most of the media, and a growing majority of Americans had lost patience with the war in Iraq. . . . My role was to figure out how to buy time, how to slow down the Washington clock, and how to speed up the Baghdad clock."

To buy time, Gates chose "to hold out hope of beginning to end it." Once the surge forces were in place, by September 2007, Gates skillfully changed the debate over the war, "making the subject of the debate the pace of troop withdrawals so as to extend the surge as long as possible but also to try to defuse the Iraq debate as a major issue in the presidential election." Gates is very clear on this: "I wanted to focus the Iraq debate on the pacing of drawdowns, a debate I thought the generals would win every time because it would be about battlefield conditions and the situation on the ground." If he could buy time, the U.S. government would not "put at risk all we had achieved at such great cost in lives by leaving a fledgling Iraqi government at the mercy of its neighbors and its internal divisions." Ultimately, "the critical question was how to

preserve and expand our gains in Iraq while maximizing support at home for a sustainable long-term presence there."

Gates's plan (for his "Washington campaign") was in line with the goals of President Bush. As media reviews of *Duty* have already made clear, Gates thought President Bush had been both correct and courageous in opting for a troop surge. However, the media reviews that I have seen do not note as well that Gates also supported Bush's intent to keep some U.S. forces in Iraq to support a post-Saddam government, train a new Iraqi army and national police, and remind the leaders of Iran that the United States would and could counter any Iranian efforts to subvert Iraq.

The key term here is "sustainable long-term presence." Would Congress accept it? Could the volunteer Army do it without wearing out? Gates worked patiently and in a determined way to get everyone who mattered "on board" with President Bush's long-term strategy. Yet he knew that implementing the president's strategy would have a high cost, especially for the troops in Iraq. Gates admits that extending troop deployments in Iraq from twelve to fifteen months was the most difficult decision he would make in his entire time as secretary, but he also believes it was the right decision, and he was confident that it would be a temporary extension. Like General Petraeus and President Bush, Gates believed that the "surge" would work, but only if given enough time.

Gates has a lot to say about the conflict in Afghanistan and the decisions made in Washington regarding the conduct of the campaign there. A lot of media attention has been given to Gates's descriptions of the disputes and discussions among key individuals, including President Obama, Secretary of State Clinton, and Vice President Biden. This attention, however, misses a major point. Along with Admiral Mike Mullen, the Chairman of the Joint Chiefs of Staff, Gates believed that "the war in Afghanistan had been neglected and underresourced [*sic*] in the Bush administration." Yet Gates was very concerned that troop levels in Afghanistan be kept low enough so that Afghans would not perceive U.S. and NATO soldiers as occupiers (as against allies). Gates was aware that "embassy polling showed that in 2005 about 80 percent of Afghans saw us as allies and partners; by summer 2009, after nearly eight years of war, that number was down to 60 percent."

President Obama had taken office committed to prosecuting a military campaign in Afghanistan against the Taliban. Gates believed that when the new president asked him to stay on as Secretary of Defense Obama agreed with him that the United States would suffer strategically if it allowed the Taliban to appear to have pushed the United States out of Afghanistan. This was the link between Iraq and Afghanistan—the need to avoid having "extremist" Muslims see the United States as having been defeated in either place. But just how many soldiers would it take to force the Taliban to agree to a settlement? That was the question that often divided the new president's White House from Gates and the military.

President Obama had agreed to a small U.S. troop increase in Afghanistan in the spring of 2009, but how many more soldiers were needed? Was there a parallel between Iraq and Afghanistan? Could a surge of forces in Afghanistan force the Taliban to negotiate with Hamid Karzai? Would Karzai even talk to them? From

September through November 2009, Gates and other senior officials met to answer these questions and thrash out a clear strategy for the campaign in Afghanistan. There were three basic questions they had to answer. Just what was the threat? What was the optimal way to deal with that threat—counterinsurgency or some form of counterterrorism? How would the president and his advisers know whether any strategy they adopted was working? It was clear to Gates that there was no unanimity among the president's closest advisers. Leon Panetta has said that all that was achieved by the major advisers after five lengthy meetings was an agreement that "we can't leave, and we can't accept the status quo."

The sticky issue was how to deal with the problem. Early in his first term, President Obama asked Bruce Riedel (whom Gates describes as "a longtime analyst at CIA . . . [and] one of the best, most realistic Middle East analysts") to lead a sixty-day review of the situation in Afghanistan. When the review team was finished, its recommendations were as follows: "Disrupt the terrorist networks in Afghanistan and especially Pakistan; promote a more effective government in Afghanistan; develop the Afghan security forces; end Pakistan's support for terrorist and insurgent groups; enhance civilian control in Pakistan; and use U.S. diplomatic, military, and intelligence channels to reduce enmity and distrust between Pakistan and India." Gates called these recommendations "breathtaking," requiring as they did "a fully-resourced counterinsurgency campaign."

According to Gates, the new president "embraced most of the Riedel recommendations and announced the elements of his new 'AfPak' strategy in a televised speech on March 27, 2009 with his senior advisors standing behind him." Gates was struck by the fact that the president "never used the words *counterinsurgency* or *counterterrorism* in the speech, but the strategy he announced was clearly a blend of both." Though he "fully supported the president's decisions," Secretary Gates had serious doubts that the resources would be available for the sort of campaign that President Obama had described—a campaign that used lots of civilian advisers, teachers, engineers, and lawyers.

In effect, President Obama said, his approach was to strike "the Taliban in their heartland" while at the same time infusing the U.S. advisory effort with a "surge" of civilians. Gates doubted that this approach would work quickly, if at all. The key factor was Pakistan. As Gates knew, Pakistan's "continuing toleration of the Afghan Taliban . . . was a hedging strategy based on [its] lack of trust in the [United States], given our unwillingness to stay engaged in Afghanistan in the early 1990s." Just as troubling to Gates was the request of the new commander of the International Security Assistance Force (ISAF) for significantly more soldiers. That commander, General Stan McChrystal, told Gates in late June 2009 "that he had found the situation in Afghanistan much worse than he expected."

Secretary Gates was placed in a very difficult position. On one hand, he had defended having a relatively small number of U.S. and NATO troops in Afghanistan, to undercut claims by the Taliban that "outsiders" were occupying the country. Now the new ISAF commander was asking for a major increase in the number of military personnel. On the other hand, the president had embraced a strategy for Afghanistan that relied on

large numbers of American and European civilians to help the Afghans develop an effective and legitimate government, useful local schools, and health-care clinics. If the troops got to Afghanistan and the civilians did not, what then?

Gates took his concern to the White House chief of staff, Rahm Emanuel. "I told Emanuel that the president needed to 'take ownership of the Afghan War,' both for the troops and for our allies. . . . He needed to acknowledge that the war could take years but that he was confident we would ultimately be successful. He needed to say publicly why the troops' sacrifices were necessary." Gates was acting then as the "fixer" that he was—the Defense Secretary who could make the best of a situation that was not to the liking of either President Obama or the ISAF commander.

However, there was another "player" in this drama, one that bedeviled Secretary Gates—then known as the National Security Staff, or NSS. This 350-person organization had begun as staff support for the members of the National Security Council and their deputies, but it had grown into a bureaucracy of its own, with what seemed to be a will of its own. As Gates puts it, "The National Security Staff had, in effect, become an operational body with its own policy agenda, as opposed to a coordination mechanism. This, in turn, led to micromanagement far beyond what was appropriate." Gates says that for all its exhausting meetings, the process by which strategy in Afghanistan was hammered out in the fall of 2009 worked. That is, the different points of view were considered, reviewed, and then accepted or rejected by those serving as the president's close advisers. Yet the implementation of this strategy was hampered again and again by micromanagement from Washington's NSS.

In the presidential election campaign of 2008, Barack Obama had chosen to take on leadership of the campaign in Afghanistan against the Taliban. But in 2009, according to Gates, he discovered that "U.S. goals in Afghanistan—a properly sized, competent Afghan national army and police, a working democracy with at least a minimally effective central government—were embarrassingly ambitious (and historically naïve) when compared to the meager human and financial resources committed to the task, especially before 2009." In short, the problem was far more severe than Obama had thought.

Gates says that the president felt trapped. "President Obama simply wanted the 'bad' war in Iraq to be ended, and once in office, the U.S. role in Afghanistan—the so-called good war—to be limited in scope and duration. His fundamental problem in Afghanistan was that his political and philosophical preferences . . . conflicted with his own pro-war public rhetoric . . . , the nearly unanimous recommendations of his senior civilian and military advisers at the departments of State and Defense, and the realities on the ground in Afghanistan." However, what Gates calls "the continuing fight over Afghan strategy in the Obama administration" had one positive outcome—that "the debate and resulting presidential decisions led to a steady narrowing of our objectives and our ambitions there." As in Iraq, the policy of the U.S. government in Afghanistan shifted in response to events. The process that led to the shift in both cases was frustrating and exhausting, and the result in each case was not what either president had wanted.

According to Gates, each president accepted his disappointment and tried his best to find a realistic solution.

There is a lot more than Iraq and Afghanistan in *Duty,* but I have focused on these two wars for two reasons. First, the decision making in both cases illustrates the importance of our presidents and their key advisers (such as Gates). Second, a major decision made in the first term of President George W. Bush created the framework in which both Bush and his successor had to work. That decision was to engage in a "long war" with Al Qaeda and any affiliated group. That is, the threat of terrorist attacks on the United States would be dealt with by changing the character of the Muslim Middle East and Afghanistan, initially through military or quasi-military action, and then over time by involving the United States deeply in the affairs of both Iraq and Afghanistan.

When President George W. Bush authorized a preemptive attack on Saddam Hussein's regime in Iraq, he hoped, I am sure, that the attack would achieve multiple goals. One was to draw the fangs of Hussein's regime. Another was to warn neighboring regimes that the United States government would and could take military action against them if they pursued policies like those of Hussein. Still another was to open possibilities for responsible, accountable, and efficient governments in the region. Yet another was to take away the Arab focus on Israel and turn it instead toward reform and modernization in the Arab states themselves.

These were very ambitious goals. The administration of George W. Bush hoped that these goals could be achieved within a reasonable human and financial cost. The Bush administration's assumption in this regard was wrong. However, as Gates understood, something had to be done to salvage the situation, and Gates worked hard with President Bush and others to achieve that.

The Obama administration took office with its own set of ambitious goals, including the aim of restoring stability and productivity in the U.S. economy. Like the administration before it, Obama's found that its goals in Afghanistan (to defeat the Taliban and create a legitimate regime in Afghanistan) were likely to be far more expensive to achieve than Congress or the American people were willing to pay. What, then, to do? As Gates's memoir shows, the administration stalled for time, in an attempt to keep the military situation in Afghanistan from growing worse while hashing out an approach that would allow President Obama to do two things that Secretary Gates did not think he could accomplish: salvage minimal but worthwhile U.S. goals in Afghanistan and simultaneously schedule the return of U.S. and NATO forces as Afghan police and army forces took up the fight against the Taliban.

Secretary Gates "bought time" for two different administrations while he dealt with serious budget issues, an often recalcitrant Defense Department bureaucracy (check out his account of his efforts to get MRAPs built and shipped to the theater), the issue of homosexuals serving in the military, the treatment of wounded military personnel, and diplomacy, especially relations with China and Russia. Is it any wonder that he felt worn out after four years and thousands of dead and wounded American military personnel?

Duty is not an easy read. It explains a lot about what a Secretary of Defense can and cannot do and how national

security decisions are made and then undone. Gates puts it very well: "While the national security apparatus to deal with . . . problems is gigantic, ultimately they all had to be addressed by just eight people: the president, the vice president, the secretary of state, the secretary of defense, the chairman of the Joint Chiefs of Staff, the director of national intelligence, the director of the CIA, and the national security advisor." *Duty* is an interesting window into the thoughts and actions of one of those eight.

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Porch, Douglas. *Counterinsurgency: Exposing the Myths of the New Way of War*. New York: Cambridge Univ. Press, 2013. 434pp. $23.88

Douglas Porch, military historian and academic, currently a distinguished professor of national security affairs at the Naval Postgraduate School, has written a highly polemical and critical intellectual history of counterinsurgency, aka COIN. It has been selected by the Army chief of staff for his professional reading list, so it is a must-read, at least for Army officers, and more generally for those who follow a debate in which sobriety and balance are rare virtues.

According to Porch, COIN's intellectual roots lie in nineteenth-century imperialism, which was often justified in paternalistic ways. Even today, COIN's mission is to "civilize" indigenous societies by importing Western norms and practices that are often severely at odds with local custom or resented because they are imported at the muzzle of an M16. Whether one considers the French in Vietnam and Algeria or the British in South Africa, Malaya, Palestine, Kenya, Ireland, and Northern Ireland (and elsewhere), the most common root of insurgency, according to Porch, is that other peoples do not wish to be ruled by foreigners. Population-centric operations (Porch does not call them strategies) designed to win hearts and minds have frequently failed, because insurgency is less about grievance resolution for a "biddable population," as COIN proponents assume, than about ideology or political goals. War among the people thus often becomes war *against* the people, for a variety of reasons, beginning with the fact that Western counterinsurgents often assume, with good reason, that "the people" are in cahoots with the insurgents, who otherwise would be unable to operate. Therefore, counterinsurgents seek to divide indigenous societies in the colonial manner so as better to control them, which only undermines the modern state building that COIN advocates seek to achieve. Furthermore, a Western tradition that sees guerrillas and insurgents as terrorists and criminal assassins and not as lawful combatants has often led to illegal detention, torture, denial of food, extrajudicial execution, disappearances, concentration camps, and other counterproductive efforts to isolate the people from insurgents, gain intelligence, and break the will of the insurgents. In this way, Porch argues that even in victory COIN usually comes at a heavy moral price.

Porch also objects to COIN proponents' seeing themselves as technicians, applying the "lessons" derived from historical cases, especially Malaya. By focusing on grievance alleviation as their central concern, these military officers engage

in "armed social work," usually creating more problems than they solve. Often well-meaning reforms, like land reform, infrastructure improvement, power sharing, self-government, demands for less corruption, and so on, that form the staples of the COIN approach end up foundering because of the resentment of a foreign military presence. Many create dependence relationships with host nationals, undermine the sovereignty and legitimacy of local authorities, have negative economic impacts, or are wasteful.

Porch considers one of the most dangerous problems with an "armed social work" approach to intervention to be the politicizing of officers, by taking them out of their military roles and giving them civic and political responsibilities, in a process referred to as "civil-military fusion." COIN proponents have often argued that the challenges of insurgency are so complex that military and political authority have to be fused. Officers, proconsuls really, have thus acquired forms of political power abroad that they would never be allowed at home. As they grew accustomed to wielding political power abroad, they sometimes grew contemptuous of political authorities at home, hijacking policy and thus damaging civil-military relations. Counterinsurgents in Algeria in the 1950s, for example, came to think that the French republic was a liability to the empire. To save the empire and the military's reputation, they believed, they had to overthrow the republic—arguably the worst possible kind of breakdown of civil-military relations and a complete inversion of the Clausewitzian approach, which subordinates strategy and those who make it to policy and political leaders. So the greatest danger is what Porch, directly following the philosopher Hannah Arendt and indirectly such thinkers as Edmund Burke and Thucydides, calls the "boomerang effect," or the "revenge of the periphery"—that coercive COIN practices and methods worked out on distant battlefields often return home, in greater or lesser degrees, in the form of repressive measures inimical to free government.

This gets to the heart of Porch's critique of COIN on strategic grounds. First, he argues that COIN is not a strategy but a collection of "lessons learned" and successful minor tactics that appear to be transferable across theaters, years, and cultures. This is especially true if special operations come to be seen as synonymous with COIN, so that it degenerates into a sort of decapitation strategy. Second, Porch holds, the case for making COIN a branch of special operations is weak. It assumes that the special operators are more adaptable than conventional forces, but Porch demonstrates that while adaptation is necessary in COIN, conventional forces are no worse (and sometimes better) at adapting than the special operators. Third, there is a serious danger in adapting too much in the direction of COIN. Had the United States gone whole hog on COIN in Vietnam, Porch suggests, it might have left itself even more unprepared than it was for Cold War conflict on the Central Front in Germany. Fourth, losers do not always give the best advice, and much of COIN theory is based on the prescriptions of losers—like David Galula, a veteran of the French war in Algeria, whose shadow looms large in the Army COIN doctrinal document, Field Manual (FM) 3-24. Porch shows that the French in Algeria actually followed Galula's principles but ultimately lost. Why? Some of those principles proved

counterproductive in practice. Isolating the people from insurgents sounds great in theory, but if it requires putting significant numbers of the people in concentration camps or driving them into exile, it is likely to produce more enemies than friends. Moreover, the strategic context, the international, social, institutional, and economic environment, was stacked against the French, as it was for them before and for the United States later in Vietnam, and then again, some might say, in Iraq. In other words, COIN is not a magic bullet. When policy makers blunder into wars involving unpredicted insurgencies with unexpected strength and resilience, to think that COIN by itself can save them from the consequences of their policies is magical thinking at best. It would be far better to rethink the policies that caused the mess in the first place.

To be clear, Porch is not arguing that COIN is bound to fail strategically. Sometimes the context is favorable. Sometimes the insurgents have no allies or sanctuaries. Sometimes their cause has no popular appeal. Sometimes their leaders are inept or so brutal that they drive the people away from them. Sometimes the incumbents are competent, willing to adapt politically and militarily to meet the challenge. More often than Porch admits, counterinsurgents do win, but not because COIN is a form of warfare only special operators can understand. "War is war!" says Porch. A strategy appropriate to the context is the most important element in victory for both the insurgent and the counterinsurgent.

These concessions on Porch's part invite readers to take some critical distance from him. When counterinsurgencies go south, maybe the problem is less with COIN as such than with failure to assess the strategic environment and adapt COIN doctrine to it. Some might object that this book is written in an angry spirit, highly polemical, and deeply one-sided. They might say that Porch has written two books, not one. The first is an intellectual history of COIN, in which the pattern of making the same mistakes occurs again and again; the second is a critique of special operations in general, one that seems unnecessary to Porch's argument and sometimes distracts from it. Plenty of insurgencies occur without the presence of foreign occupiers, so one cannot blame them or the problems of counterinsurgency on imperialism or paternalism alone. Porch is right that General Petraeus was lucky that the surge in Iraq coincided with the so-called Sunni Awakening against Al Qaeda and with other developments in Iraq, but strategic wisdom often involves taking advantage of good luck. If Petraeus's relative success in Iraq did not result directly from his personal role in redrafting American COIN doctrine and applying it intelligently to Iraq, it was nonetheless a vast improvement over the work of his predecessors, who did not plan for a potential insurgency and were slow to confront it—even occasionally aggravated it. Arguably the war in Iraq, a war of choice, was a strategic mistake, with American service members stuck cleaning up the mess until the U.S. government could find a dignified way to leave. Yet no less arguably, there was no alternative to intervening in Afghanistan, about which Porch says very little, because to fight Al Qaeda, which was sheltered by the Taliban, the United States in 2001 found it necessary to overthrow the government, though with a high probability that it would have to deal with an insurgency from the Taliban while fighting the terrorists.

Porch suggests no alternative approach for Afghanistan, so his critique has limited usefulness for evaluating U.S. strategy in that conflict. Afghanistan, indeed, is a very tough case for Porch's critique. It invites readers to ask whether problems there resulted from trying too much or too little COIN, while domestic support in the United States for the war was high before getting distracted with Iraq. Or perhaps the strategic context was so challenging that nothing better than a weak government in Kabul could have been expected—implying, perhaps, that after scattering Al Qaeda in 2001, the best realistic option would have been to withdraw quickly and turn the struggle over to whatever government the Afghans managed to establish, even if it did not meet many Western standards of good government. Or maybe the problem was that COIN doctrine can lead to unrealistic expectations that provoke precisely the kind of critique Porch has written. Had Porch focused more on what is necessary to make such expectations more sober—how he might have rewritten Army FM 3-24, for example—his book would have been improved substantially. Instead, those who rewrite that manual will have to take both Porch's book and more than a grain of salt into account in developing an approach to COIN that is genuinely sober in its expectations.

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Shi Xiaoqin. *Seapower and Sino-U.S. Relations*. Beijing: Military Science, 2013. 320pp. ¥42

Seapower and Sino-U.S. Relations is a comparative study of the quest for sea power by nations that are considered "maritime power states" and "continental power states" and it is an attempt to apply related lessons to an understanding of current Sino-U.S. relations.

According to the author, traditionally maritime powers, such as the United States and the United Kingdom, have generally adopted a more offensive posture in their quest for sea power, mainly in terms of gaining "command of the sea" or in influencing development on the continent, as reflected in the works of American and British sea-power theorists Alfred Mahan and Sir Julian Corbett. The key to understanding Mahan, the author holds, is his emphasis on the aim of acquiring "absolute command of the sea" through decisive fleet engagement, which requires force concentration and capital ships capable of superior firepower. This central aim relegates other aims, such as sea-lane protection, commerce raiding, and naval blockade, and the building of capabilities requisite for them, to lesser priorities.

Mahan, however, is critically questioned by Corbett, Shi Xiaoqin points out. Corbett, for instance, believes "absolute command of the sea" is neither possible nor necessary, because most of the seas, most of the time, are open and contested and accessible for productive use and exploitation. As a result, flotilla operations to protect sea-lanes may be important, but building capital ships for "decisive fleet engagement" may divert resources away from them. Also, the more the strong side wants a decisive battle through force concentration, the more incentive the weak side has to avoid such an engagement, through force dispersion to reduce losses. For Corbett, according to the author, sea control should also serve more useful

objectives like influencing developments on land (the European continent, in his time). He, for instance, believes that such maritime powers as the United Kingdom are particularly advantaged in waging limited wars because of their insulated nature. Consistent with the British role as an "offshore balancer," these wars may involve naval blockades to keep a continental opponent from entering the oceans; coordination with Britain's land allies to bog down the opponent in a land war; selection of limited objectives against the opponent in far-away colonies, where the stakes are smaller and the enemy finds it difficult to mobilize; and expeditionary, amphibious operations against limited but critical and vulnerable targets on continental peripheries to restore the equilibrium on land. According to Shi, however, a major challenge facing Corbett's theory of limited war is how much the United Kingdom can devote to the continental objectives. Too much may get it bogged down in a land war of attrition, but too little may result in a policy of appeasement, where continental development is not impacted.

Unlike maritime powers, according to Shi, the quest for sea power by continental powers, such as France, Germany, and the former Soviet Union, tends to be more limited. Rather than seeking command of the sea, their quests are more characterized by attempts to disrupt or deny the command of the sea by dominant sea powers, through asymmetrical strategies and capabilities. Also, these attempts do not aim to influence fundamental developments in the homelands of the dominant sea powers. Both the French and German navies of the late nineteenth century up to World War II, for instance, generally exploited technologies of torpedoes and submarines as asymmetrical capabilities. Being the weaker sides, for instance, they gave priority to not frontal fleet engagement but raiding the maritime commerce of opponents like the United Kingdom, a vulnerability of the latter as maritime trading and colonial powers. The Soviet Union during the Cold War also prioritized submarines in its naval development, though it did develop major surface combatants. These ships served mainly to provide surface and air coordination and cover for submarine operations.

A major reason for continental powers to be rather limited in their quest for sea power is the security challenges they face from both continental and maritime fronts. France, for instance, had to deal with threats from both Germany and the United Kingdom, while Germany faced challenges from France and the United Kingdom. Similarly the Soviet Union during the Cold War had to prepare for a land war in Central Europe, while at the same time handling challenges on its maritime flanks. The continental threats have generally constrained the resources that could be used for naval development.

The author believes China's geostrategic position today is quite similar to those of the historical continental powers. It faces challenges from an insulated maritime power, the United States, that intends to influence developments on the Asian continent and whose disadvantages of distance are reduced by modern technologies and forward basing. Also, faced with land-based challenges that may constrain resources, China's quest for sea power is likely to remain defense dominant. To enhance its security, however, and not be pressed against its own shores, China is likely to strive to

extend its maritime strategic depth and to disrupt and deny the absolute U.S. superiority in the narrow "East Asian littoral" or turn it into a "zone of contestation." China's strategies and capabilities, according to Shi, are likely to be asymmetrical, and they can benefit from such modern technologies as long-range combat aircraft and missiles. China's acquisition of major naval surface combatants mainly serves to supplement such capabilities, as well as to protect vital sea-lanes on which China's economy depends. On the other hand, reduced U.S. military forward presence and globalization-induced nontraditional security challenges are likely to offer opportunities for Sino-U.S. cooperation.

This is probably one of the few Chinese books that reflect not only an in-depth understanding of Western naval literature but also analytical ability to evaluate this literature critically to gain insight into current U.S.-China relations. Because the author serves as a research fellow and a managing editor of the journal *Strategic Studies* at the War Theory and Strategic Studies Department of China's Academy of Military Science, the book may reflect an important perspective for understanding the extent and nature of China's quest for sea power.

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Yahuda, Michael. *Sino-Japanese Relations after the Cold War: Two Tigers Sharing a Mountain.* New York: Routledge, 2014. 146pp. $149.50 (paperback $33.18)

Veteran East Asia international relations analyst Michael Yahuda explores the traditional Chinese aphorism *yī shān bù róng èr hǔ,* or "two tigers competing for one mountain" (一山不容二虎), in analyzing the changing relationship of the two great powers of East Asia—China and Japan. The proverb is a good foil for his subject and has led to a nuanced and balanced essay on Chinese-Japanese relations during the forty-plus years since the two established diplomatic ties in 1972. His book is succinct. Each sentence pushes the narrative forward, making the book an ideal synopsis for busy policy analysts or East Asia students with extensive reading lists.

The chronological meat of the book is a detailed discussion of key periods in Chinese-Japanese relations, starting with the rapprochement between Mao Zedong and Kakuei Tanaka in the 1970s. In 1972, Mao forgave the Japanese for twentieth-century aggression, even forgoing war reparations. China's economic reform movement began with Deng Xiaoping's visit to Japan in 1978, setting the stage for the 1980s honeymoon period before the Cold War ended. This is instructive, because it demonstrates that tigers can more happily coexist during some periods than at other times. Yahuda then discusses Japan as the first country to reembrace China after the isolation imposed on Beijing in the wake of the Tiananmen crackdown of 1989. As the Soviet Union folded in 1991, bringing the Cold War to a close, the trajectory of Japan as number one leveled off into a two-decade period of economic stagnation. In contrast, Deng successfully transferred the helm and the reform mission to Jiang Zemin before passing away in 1997. By 2000 Chinese gross domestic product (GDP) had grown to 25 percent that of Japan's. The relationship between Jiang and Prime

Minister Junichiro Koizumi went steadily downhill between 2000 and 2005, as Koizumi repeatedly visited the Yasukuni Shrine; Jiang played the history card at every turn, having none of Mao's forget-and-forgive approach.

The relationship improved when Shinzo Abe replaced Koizumi in 2005, but the subsequent annual turnover of Japan's prime ministers gave Hu Jintao's steady hand on the tiller time to overtake Japan economically, as well as to spend heavily on military infrastructure improvements, most notably on the People's Liberation Army Navy. By 2010, China's GDP had surpassed Japan's, and its economy was the second largest in the world, after that of the United States. Periodic conflict over the Senkaku/Diaoyu Islands has recently led to a series of status quo changes in China's favor, as China's leadership baton was handed to Xi Jinping in November 2012 and Japan's returned to Abe, reelected in December 2012. China and Japan both bristle over naval patrols and air-defense zones around the disputed islands, as well as, in Japan's case, at Xi's demands for twentieth-century-history apologies from Japan, while Abe for his part visited Yasukuni in late December 2013 on the anniversary of his first year in office.

The theoretical meat of the book is no less interesting. Yahuda uses a blend of sociocultural constructivist approaches, liberal economic and institutional interdependence analysis, and realist strategic analysis to discuss the complex interrelationship between China and Japan, as well as their competitive relations with the Koreas, Taiwan, and the states of Southeast Asia. In Yahuda's analysis, the United States is the key swing variable in the relationship between the Asian tigers, first as Japan's ally and second as China's opposite on the world stage of great-power relations.

A version of the "two tigers" Chinese proverb was used recently by S. C. M. Paine in her book *The Wars for Asia, 1911–1949* (2012). She used the phrase to refer to the two protagonists of the long Chinese civil war, the Nationalists and the Communists. Her translation gloss, "Great rivals cannot co-exist," implies a zero-sum game. Yahuda's conclusion is that two tigers on a single mountain need not represent a zero-sum game. He posits that in the period ahead, the two tigers, China and Japan, must share the same mountain, East Asia. Recent events confirm that this is a tough matchup, with both tigers snarling ferociously, neither inclined to back down the mountain.

GRANT F. RHODE
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Yetiv, Steve A. *National Security through a Cockeyed Lens: How Cognitive Bias Impacts U.S. Foreign Policy.* Baltimore, Md.: Johns Hopkins Univ. Press, 2013. 168pp. $24.95

There's an old saying, usually attributed to Mark Twain, that the Missouri River is "too thick to drink and too thin to plow." At first glance, the same might be said for this book, in that Steve Yetiv seeks to appeal to the scholar, to the practitioner, and to the lay reader, serving the lay reader best but not without utility to the practitioner and scholar.

Yetiv is the Louis L. Jaffe Professor of International Relations at Old Dominion University and University Professor. His premise in this book is simple. Cognitive biases impact human decision making and tend to reduce the impact

of attempts to use a rational decision-making process. The impact of these biases is almost always adverse and affects all decision making, even when the president deals with national security issues. The author also claims that these biases are not usually taken into account when teaching about or actually engaging in decision making. This claim may be somewhat overstated, as many decision making courses, including those at the Naval War College, do acknowledge the potential effect of cognitive biases on decision makers, but the main point—that cognitive biases affect decision making—has considerable merit.

This book has a commendably straightforward structure. Yetiv presents five case studies, each important to U.S. national security, in which cognitive biases are argued to have played a major role. The first two case studies examine the U.S. reaction to the Soviet invasion of Afghanistan and the Reagan administration's decision to sell arms to Iran and transfer the profits to the "Contras," an armed group fighting in Nicaragua. The third case study seeks to explain how mental biases affect jihadists' view of the United States. The fourth analyzes the George W. Bush administration's decision to invade Iraq in 2003. The fifth and final case looks at the role of cognitive bias in what Yetiv describes as a failure to develop a comprehensive U.S. energy policy.

The first case examines misperceptions on the parts of both the United States and the Soviet Union. Yetiv delivers a convincing argument that cognitive biases likely played a role in each actor's decision making. Members of the Jimmy Carter administration, particularly Zbigniew Brzezinski, always saw the Soviets as planning offensive moves, perhaps designed to gain access to the Persian Gulf. In reality, decision makers in Moscow authorized the invasion as a defensive move, to prevent the fall of a friendly socialist government in Kabul. Thus, U.S. decision leaders misinterpreted the reason behind the Soviet invasion and their Soviet counterparts misinterpreted subsequent U.S. reactions.

Yetiv argues that the Iran-Contra case represents two cognitive biases that played significant roles—"the focusing illusion" and "noncompensatory decision making." The focusing illusion led decision makers to place excessive importance on one aspect of an event—American hostages held in Lebanon—while the noncompensatory bias produced a focus on the belief that some particular factor is so important that it cannot be balanced by any other factor or combination of factors, which in this case only increased America's determination to recover the hostages. The result was a willingness to grasp at slender straws and attempt risky actions because of the artificially high value placed on the hostages.

Yetiv then attempts to explain why Al Qaeda and similar organizations so hate the United States and are quite willing to kill "millions of Americans." Yetiv's explanation centers on "distorted perceptions" and on a combination of "confirmation bias" and an additional bias known as "the clustering illusion," which basically means that the leaders of Al Qaeda have a warped view of the United States—they see what they want to see.

The fourth case advances the primary claim that President Bush and his key advisers suffered from overconfidence when they planned and executed the invasion of Iraq in 2003. They were also, according to Yetiv, overoptimistic.

These attitudes were encouraged by both the misuse of analogies and the personality and style of Bush. The final discussion, on U.S. energy policy, seeks to determine why the United States, despite the oil embargo of the early 1970s and a continually acknowledged need for a long-term, consistently applied energy policy, has been unable to put such a policy into effect.

However, national security decisions by their very nature are extraordinarily complex. To his credit Yetiv recognizes and addresses these complicating factors. In each case he presents, there is a deliberate attempt at least to identify, if not discuss, alternate explanations and influential factors not relating to cognitive biases. For example, in the case of U.S. energy policy, Yetiv makes a persuasive argument that a general unwillingness to pay more, the power of the automobile industry's lobby, and a short congressional election cycle go a long way in explaining why the United States tends to resemble Aesop's grasshopper more than it does his ant.

That said, the book still leaves questions unanswered. For example, how can the cognitive biases held by Al Qaeda's leaders become those of all their followers? In what ways are group biases different from groupthink? How can an analyst determine the relative importance of cognitive biases in explaining or, better, predicting a decision? Finally, given all the other forces acting in the decision domain and on the decision maker, how can one determine how important biases may be in the overall mix? Yetiv does attempt to offer some methods to combat the effect of cognitive biases. Surprisingly, he argues that merely knowing such biases exist is not enough to guard against their effect. Better approaches include the use of a devil's advocate, the institution of formal decision-making processes, and expansion of the circle of advisers consulted prior to a decision.

At the end of the day, *National Security through a Cockeyed Lens* is worth a read. By not overselling his argument, Yetiv makes a stronger case for considering the presence and possible impact of cognitive biases. In doing so he also makes the case, perhaps inadvertently, that rather than being used in isolation, models of decision making should be used in conjunction with one another—and that is a very useful concept.

RICHARD NORTON
Naval War College

Delgado, James P. *Silent Killers: Submarines and Underwater Warfare.* New York: Osprey, 2010. 264pp. $33

Given the book's title and the cover photo of the *Los Angeles*–class fast attack submarine USS *City of Corpus Christi,* readers might reasonably assume that James P. Delgado's *Silent Killers: Submarines and Underwater Warfare* is focused on modern submarines and undersea warfare. However, this is not the case. Instead, it is a small coffee-table book on the overall history of submarines, with pronounced emphases on early (pre–World War I) development and on the archaeology of submarine wrecks. A few minutes on the Internet readily explains this. In addition to having a keen interest in submarines, Delgado is a historian, former executive director of the Vancouver Maritime Museum, and PhD in archaeology who has published nearly thirty books. He is also a cohost of National Geographic's

Sea Hunters television series. This work reflects all his credentials. It is well written, it documents its sources, it is visually compelling, and it entertains.

Despite these strengths, however, many *Review* readers will find that important aspects of underwater warfare are given short shrift. For example, submarine aspects of World Wars I and II are dealt with in nineteen and seventeen pages, respectively, with illustrations making up approximately seventeen of those pages. Consequently, the discussion and descriptions lack depth and detail, which is a shame. Similarly, ballistic-missile submarines receive only five pages of what must honestly be said is superficial coverage, which mirrors the passing discussion of modern nuclear-attack submarines. This shortfall is compounded by the author's twice relating the questionable, if not bizarre, hypothesis that the nuclear attack submarine USS *Scorpion* was sunk on 15 May 1968 by the Soviets "in the belief that an American submarine had collided and sank the Golf II boat *K-129* in the Pacific on March 8, 1968." The citation provided for that salacious theory is not one that one would expect of careful research. There are other, much more credible and likely explanations, which this book fails to examine.

On the other hand, one of the book's strengths is a thoughtful discussion of the development, employment, and archaeological recovery and preservation of the Confederate submarine *H. L. Hunley,* lost during the Civil War. Similarly, David Bushnell's American Revolutionary War submarine *Turtle* receives worthwhile treatment, including an update on the debate concerning whether *Turtle* had enough positive buoyancy to allow boring a hole in the target ship's copper-clad wooden hull while submerged. Another strength is the book's photos, which will fascinate modern submariners.

Many will find this book worth reading, and much of it well rewards the time invested. Like a National Geographic television production, this work is entertaining, lavishly and excellently illustrated, and it reflects the producer's or author's passion, which in this case appears to be undersea archaeology. This book is broad rather than deep, however, and as such will probably interest the generalist more than the specialist.

WILLIAM MURRAY
Naval War College

OF SPECIAL INTEREST

THE EDWARD S. MILLER RESEARCH FELLOWSHIP IN NAVAL HISTORY

The Naval War College Foundation intends to award one grant of $2,000 to the researcher who has the greatest need and can make the optimal use of the research materials for naval history located in the Naval War College's Archives, Naval Historical Collection, Naval War College Museum, and Henry E. Eccles Library. Further information on the manuscript and archival collections and finding aids are available on request from the Head, Naval Historical Collection, Naval War College (e-mail evelyn.cherpak@usnwc.edu) or the selection committee chair (e-mail john.hattendorf@usnwc.edu). This information can also be found on the website of the Naval War College at usnwc.edu/archives.

The recipient will be a Research Fellow in the Naval War College's Maritime History Department, which will provide administrative support during the research visit. Submit a detailed research proposal that includes a full statement of financial need and comprehensive research plan for optimal use of Naval War College materials, curriculum vitae, at least two letters of recommendation, and relevant background information to Miller Naval History Fellowship Committee, Naval War College Foundation, 686 Cushing Road, Newport, R.I. 02841-1207, by 1 August 2014. For further information, contact the chair of the selection committee. Employees of the Naval War College or any agency of the U.S. Department of Defense are not eligible for consideration; EEO/AA regulations apply.

REFLECTIONS ON READING

Professor John E. Jackson is the Naval War College's program manager for the Chief of Naval Operations Professional Reading Program.

Reflections on Reading," a regular feature of the *Review,* serves to promote the reading of important works by sailors of all ranks within the Navy. It normally features books from within the Chief of Naval Operations Professional Reading Program (CNO-PRP). Past articles have also encouraged readers to reach beyond the eighteen books in the formal program, to find other books of significance to maritime professionals. One such book is *Nimitz,* by E. B. Potter. First published in 1976, it is still widely available and read today. It has long been considered the definitive book on the life and career of the late fleet admiral Chester W. Nimitz, USN. He commanded all the Pacific Ocean Areas (including that of the Pacific Fleet, as CINCPACFLT) during World War II and later served as Chief of Naval Operations. It is the story of a sailor from Texas who joined the Navy to serve his country, overcoming significant challenges (including a court-martial!) to rise to the highest levels of Navy leadership. While this book provides many details about his conduct of the Pacific War, a recent initiative at the Naval War College has provided historians, and even the casual reader, a remarkable opportunity to read about the day-to-day activity that took place in CINCPAFLT headquarters from the attack on Pearl Harbor to the signing of the Japanese surrender on the deck of USS *Missouri* nearly four years later.

On 24 February 2014, the 129th anniversary of the birth of Fleet Admiral Nimitz (Naval War College class of 1923), the College formally unveiled the digital *Nimitz Graybook.* This effort created a high-definition digital version of the four thousand pages of the day-by-day history of World War II in the Pacific maintained by Fleet Admiral Nimitz's headquarters, a collection commonly referred to as the "Graybook," for the color of the covers that originally bound the pages. This historic treasure was hidden from the public for nearly seventy years, first by its classification level, then because it was available only to researchers who could see it in person at the Naval History and Heritage Command in Washington, D.C. It is now available to the public at large, worldwide, on the

Naval War College Historical Collection site at www.usnwc.edu/Graybook. This project is in keeping with the Naval War College's long-term commitment to preserving and sharing the full range of historical resources to the widest possible audience. Seven volumes are arranged chronologically, which allows readers to follow the course of action as it occurred seven decades ago. An eighth volume focuses exclusively on the battle of Midway. Captain Henry Hendrix, the director of the Naval History and Heritage Command, has noted, "I've seen the collection, and it is really a national treasure. The documents clearly reveal what Nimitz thought was important, which gives the reader a great deal of insight into how his experiences both operationally and at the Naval War College informed and influenced his prosecution of the war. I am eager to see the collection discussed and demonstrate the continued relevance of leveraging history in the decision making process."

While the CNO-PRP encourages reading, no one expects you to read every word on all four thousand pages! But once you start reviewing the pages, with handwritten notes and initials in the margins of many pages, you may become enthralled. Thankfully, the Digital Graybook is also searchable by keywords, which enables readers to jump directly to areas of specific interest.

The availability of the Nimitz-related material discussed above is an excellent example of how technology can enrich the reader's experience. The information available from a hard-copy book can be amplified by simple topic searches using online search engines, and by accessing websites that provide resources such as the *Nimitz Graybook*.

The CNO-PRP books that have been distributed around the fleet are kernels of information—they have great value in themselves but can also lead a reader to discover much more. The key is to turn the first page, and see where it leads!

JOHN E. JACKSON